NASA GSFC Advanced Architectures and Automation (Code 588)

SPLAT SOFTWARE ARCHITECTURE DOCUMENT

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Software Architecture Document for SPLAT

Prepared by:
Jeffrey M. Robinson
Aquilent, Inc.

Document Summary

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Author	Jeffrey Robinson
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May 28, 2002	1.1	Modifications per internal SPLAT team review.
June 13, 2003	1.2	Modified per review comments.
June 17, 2002	1.3	Made MMS Interface TBD.

Approvals

Title	Name	Signature	Date

Table of Contents

1 Introduction

The purpose of this document is to describe the software architecture for the SSR Playback Automation Tool (SPLAT), formerly known as Goal Oriented Commanding (GOC) that is being developed at the NASA Goddard Space Flight Center Advanced Automation and Architectures Branch (Code 588). This document describes SPLAT and will be used to drive the design and implementation of the system.

2 References

The following references were used in preparation of this document:

1. SPLAT System Requirements Specification version 1.2 April 18, 2002.
2. SPLAT Project Management Plan version 1.0 April 2002.

3 Architectural Representation

This document presents the architecture as a series of views; Use Case Views, Logical Views, Process Views, and Deployment Views. These views are presented as TogetherSoft Models that use the Unified Modeling Language (UML).

The Use Case Views describe the set of scenarios and/or use cases that represent some significant, central functionality. It also describes the set of scenarios and/or use cases that have a substantial architectural coverage (that exercise many architectural elements) or that stress or illustrate a specific, delicate point of the architecture.

The Logical Views of the architecture describe the most important classes, their organization in service packages and subsystems, and the organization of these subsystems into layers. It also describes the most important use-case realizations using interaction (collaboration) diagrams. Class diagrams are included to illustrate the relationships between architecturally significant classes, subsystems, packages and layers.

The Process Views describe the tasks (processes and threads) involved in the system's execution, their interactions and configurations. It also describes the allocation of objects and classes to tasks. Finally, the Deployment Views describe the various physical nodes for the most typical platform configurations and describe the allocation of tasks (from the Process View) to the physical nodes.

4 Architectural Goals & Constraints

This section enumerates key requirements and system constraints that have a significant bearing on the architecture. They are:

1. The architecture should support retrieving report data either from the MMS system automatically (TBD) or via manual placement of input files in a common directory on the operator’s local machine (PC).
2. The primary user interfaces for playback scheduling, etc. must be able to run on a user’s Java enabled PC.
3. All usability, reliability, performance and loading requirements as stipulated in the SPLAT System Requirements Document [1], must be taken into consideration as the architecture is being developed.

5 Use Case View

The Use Case View presents a summary of the architecturally significant use cases and the use case realizations that form the basis for the main threads of the SPLAT tool:

- Ingesting manually retrieved MMS reports.
- Extracting contact information and mode changes.
- Managing the input reports.
- Configuring display and print options.
- Selecting modeling parameters.
- Generating the SSR buffer playback schedule.

For additional detail refer to the referenced Use Case Report in the SPLAT System Requirements Document.

5.1 Architecturally Significant Use Cases

Figure 5-1 depicts the architecturally significant use cases for SPLAT. It addresses those use cases that provide broad functional and architectural coverage or that entail significant development risk. Additional use cases will be incorporated in the next iteration of the SPLAT System.

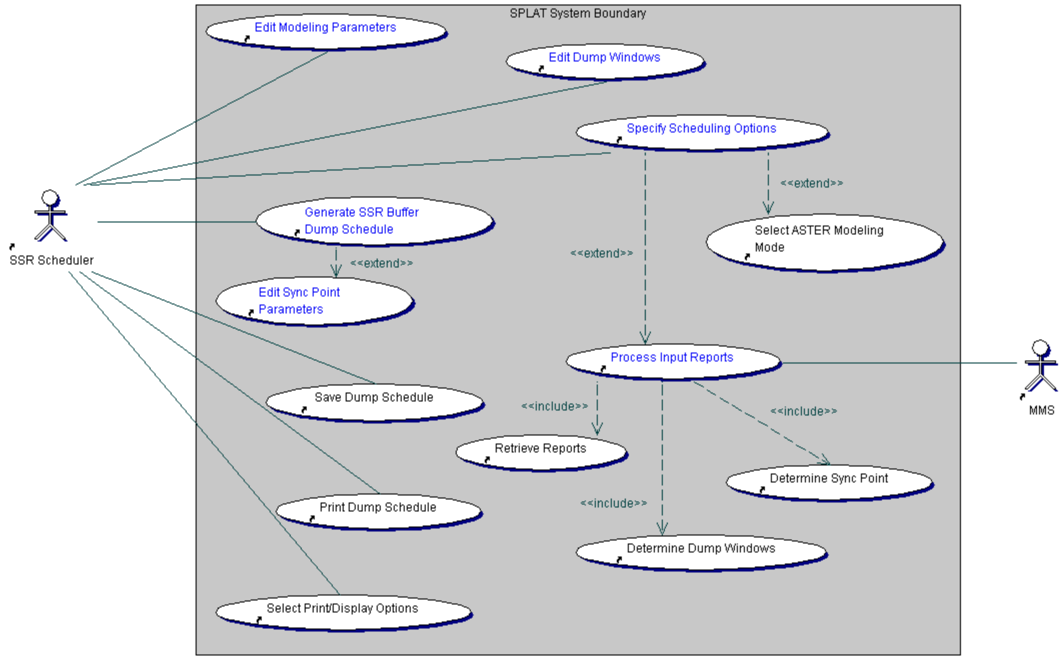


Figure 5-1: Significant Use Cases

The following sections present a brief description of the use cases and use case realizations (scenarios).

5.1.1 Determine Dump Windows

Brief Description: After all input reports have been processed, the system determines an initial set of dump windows based on the parsed contact information and the user selected scheduling options.

5.1.1.1 Use Case Realization Determine Dump Windows

This scenario describes the automated determination of dump windows within each of the contacts specified in the scheduling window.

Note that manual determination of dump windows requires that the operator manually enter each dump window. That functionality is detailed in the Edit Dump Windows Use Case realization.

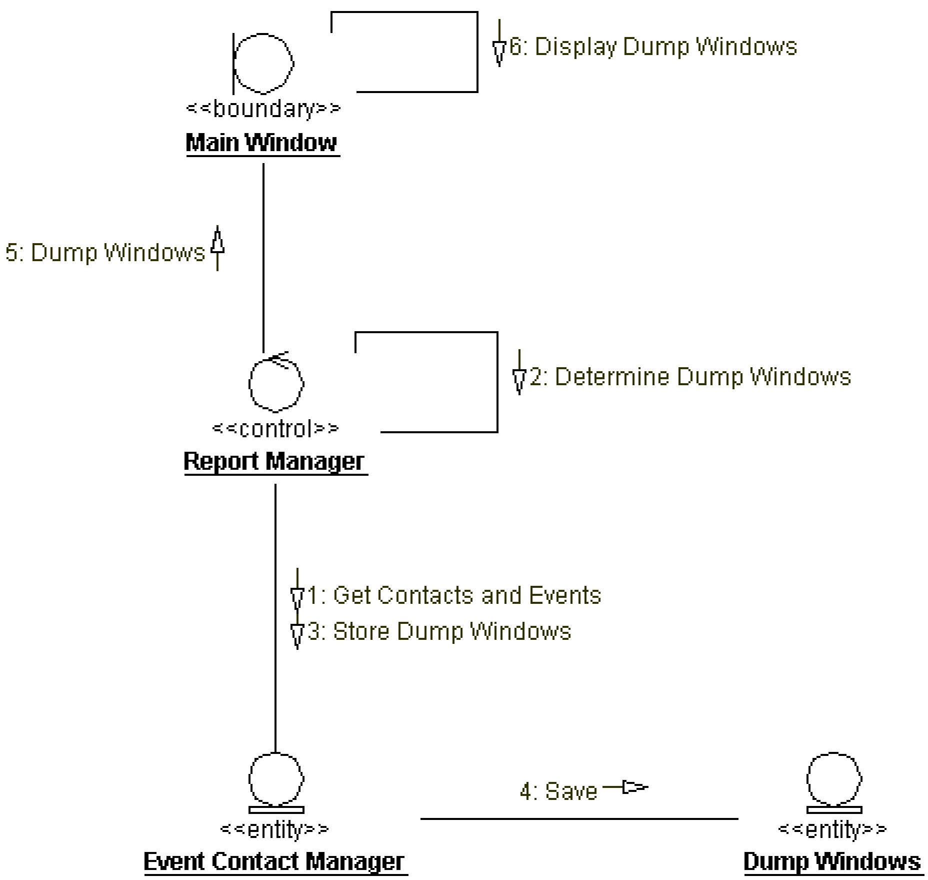


Figure 5-2: Automated Dump Window Determination

Description: The operation detailed in Figure 5-2 is initiated by the Report Processing activity.

1. After all reports have been processed, the Report Manager retrieves the time ordered list of contact windows and mode change events extracted from the input reports.
2. From the retrieved contact information and mode changes, the Report Manager determines how many dump windows should be placed in a contact period (one or two) and where to place the dump windows (AOS or AOS and LOS). Initially, the Report Manager will place a single Dump Window at AOS for each K or X band contact. Later versions of SPLAT will have a more intelligent dump window determination algorithm.
3. Once the Report Manager has determined dump windows for each of the contact periods in the planning horizon, it adds the dump window to the contact.
4. The Report Manager then saves the dump window settings.
5. The Report Manager then delivers the dump windows to the Main Window.
6. The Main Window displays the dump window entries on the time line for user review.

5.1.2 Determine Sync Point

Brief Description: After all reports have been processed and prior to dump window determination, the SPLAT system automatically determines the appropriate starting point (contact) where schedule generation will begin.

5.1.2.1 Use Case Realization Determine Sync Point

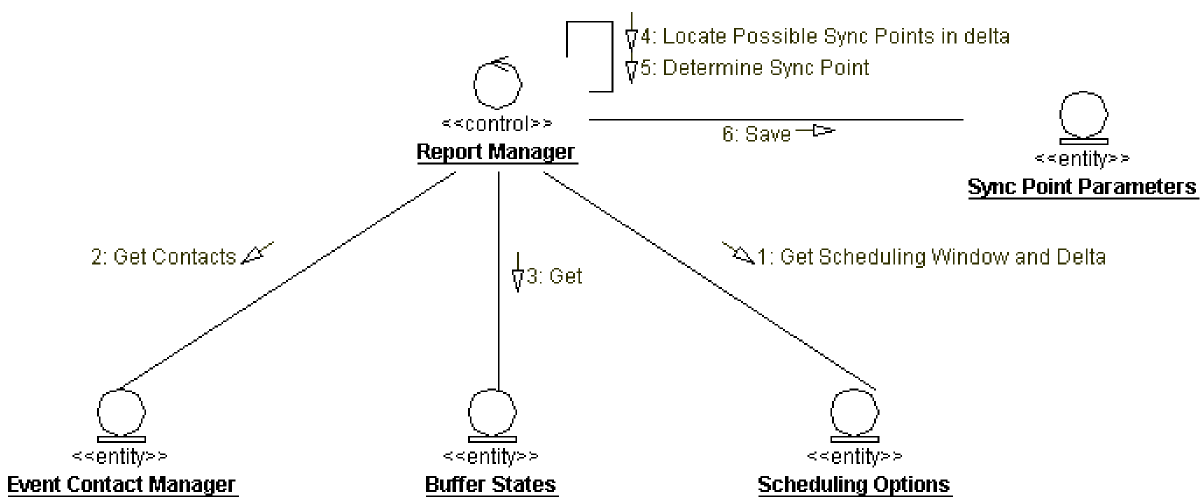


Figure 5-3: Determine Sync Point Realization

Description: The operation detailed in Figure 5-3 and described here is initiated by the Report Manager after report processing has completed but prior to dump window determination.

1. The Report Manager retrieves the scheduling window start and stop times and the delta (amount of time prior to the scheduling window start in which to look for a synchronization point. Specified as hh:mm) for the planning horizon from the scheduling options.
2. The Report Manager then requests the contact windows from the Event Contact Manager.
3. The Report Manager retrieves the buffer states entries extracted from the SSR Buffer states Report.
4. The Report Manager examines the buffer states, schedule start time and extracted contact information to determine all buffer states entries for the interval (start_time – delta, start_time).
5. Next the Report Manager examines the buffer state entries in the delta window to determine the latest entry before the start of the scheduling window in which the SSR buffers can be completely emptied.
6. The Report Manager marks this buffer state entry as the synchronization and stores it in the sync point parameters along with the other sync point candidates in the delta window.

5.1.3 Edit Display/Print Filter Options

Brief Description: When the operator selects the edit print filters option or the display filters option, the system displays a dialog through which the user is able to select the fields and event types displayed on the timeline and printed in hardcopy print outs.

Two Use Case realizations are provided here. One describing selection of the displayable fields and event types (Figure 5-4), and one describing selection of the printed fields and event types (Figure 5-5).

5.1.3.1 Use Case Realization Edit Display Filter Options

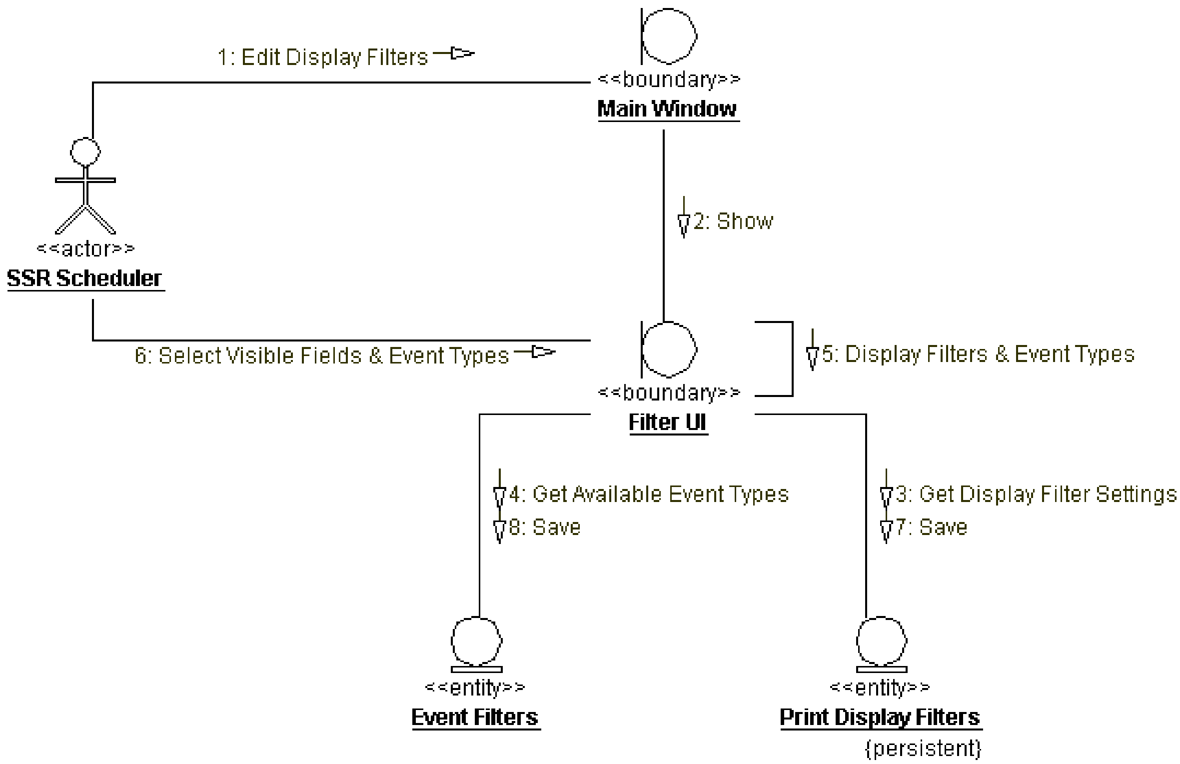
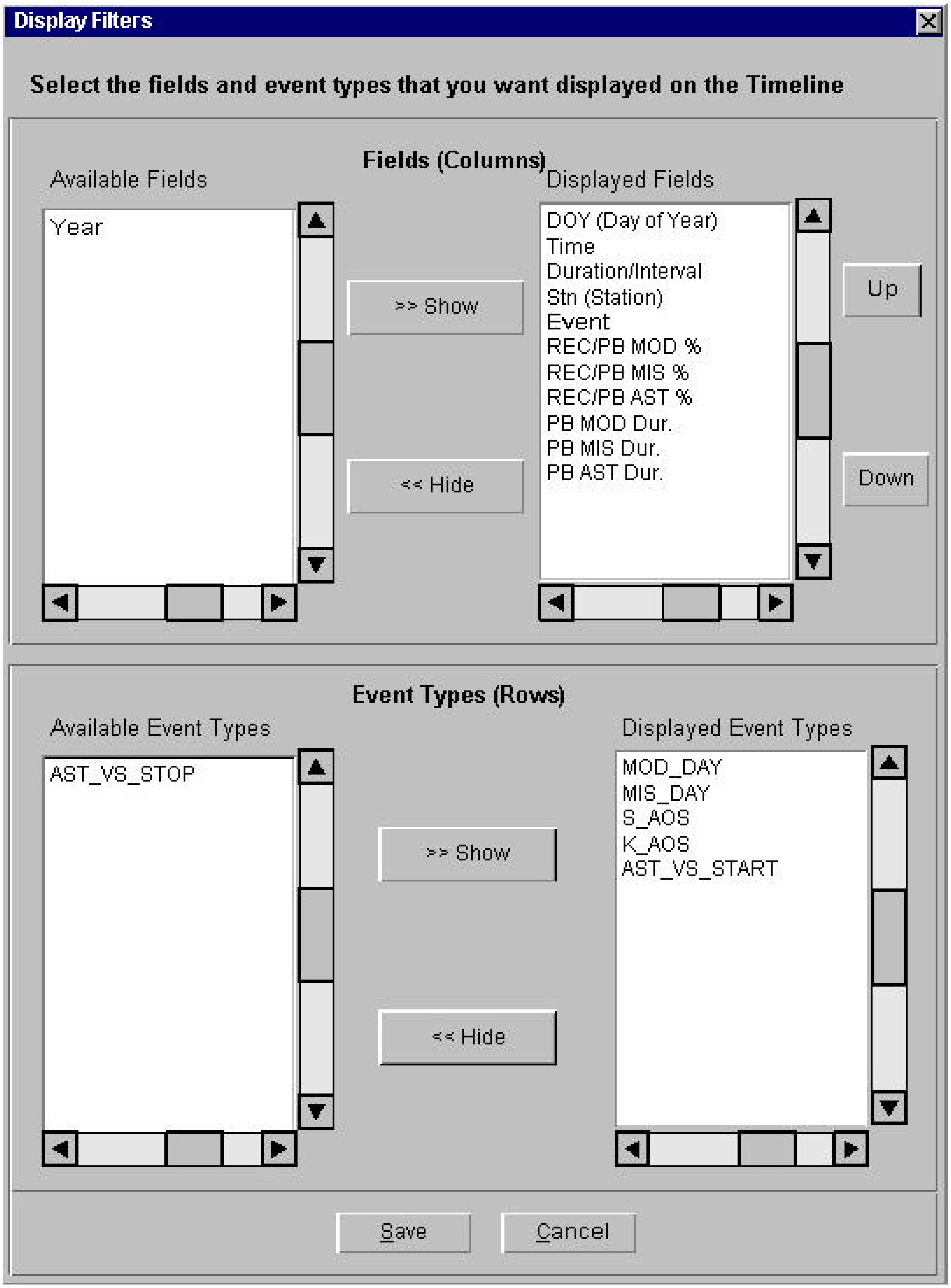


Figure 5-4: Edit Display Options



Description:

1. The SSR Scheduler selects the edit display filters option from the Main Window.
2. The Main Window creates an instance of the Filter UI and displays it to the SSR Scheduler.

3. The Filter UI retrieves the current display filter settings.
4. The Filter UI retrieves a list of available and filterable event types in the input reports.
5. The Filter UI displays the current display filters and available events for SSR Scheduler review/modification.
6. The SSR Scheduler selects from the available list of fields and event types, which are visible on the timeline and which are hidden.
7. When the SSR Scheduler accepts the modifications by selecting the save option in the Filter UI, the print filters are saved.
8. The Filter UI then saves the modified event filters when the UI is dismissed.

5.1.3.2 Use Case Realization Edit Print Filter Options

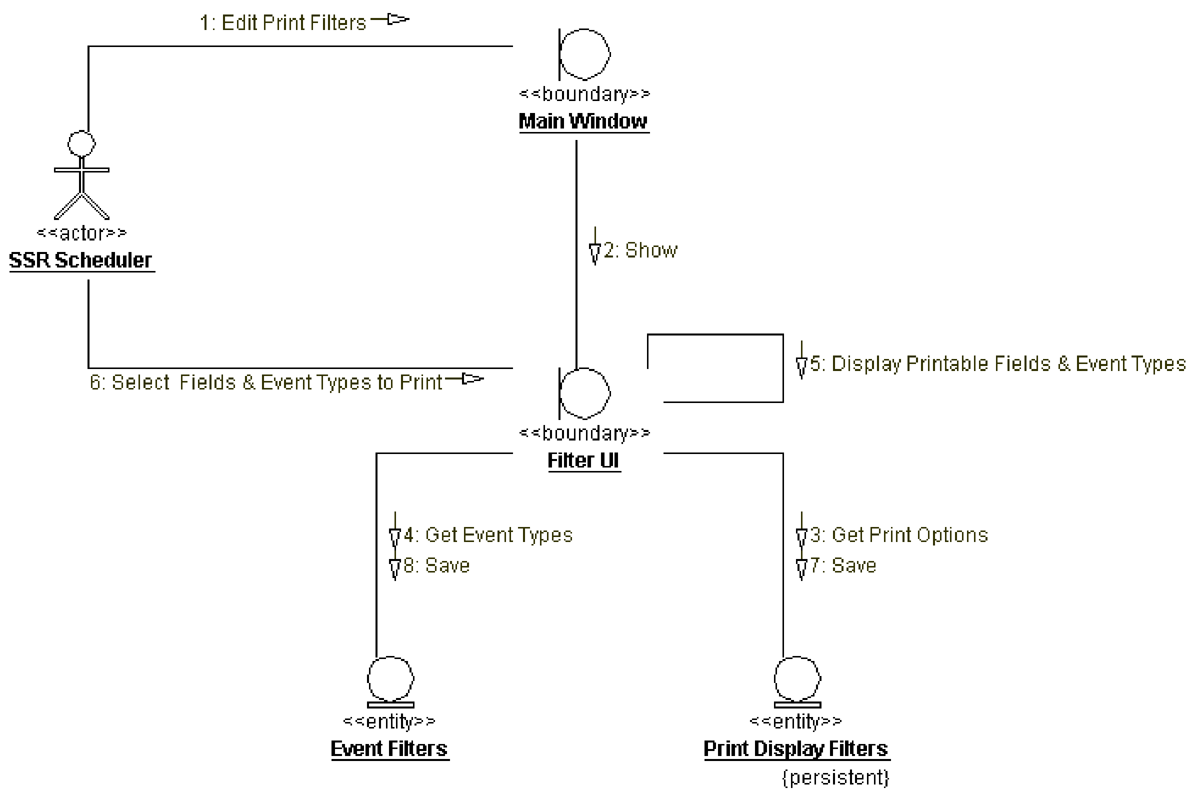
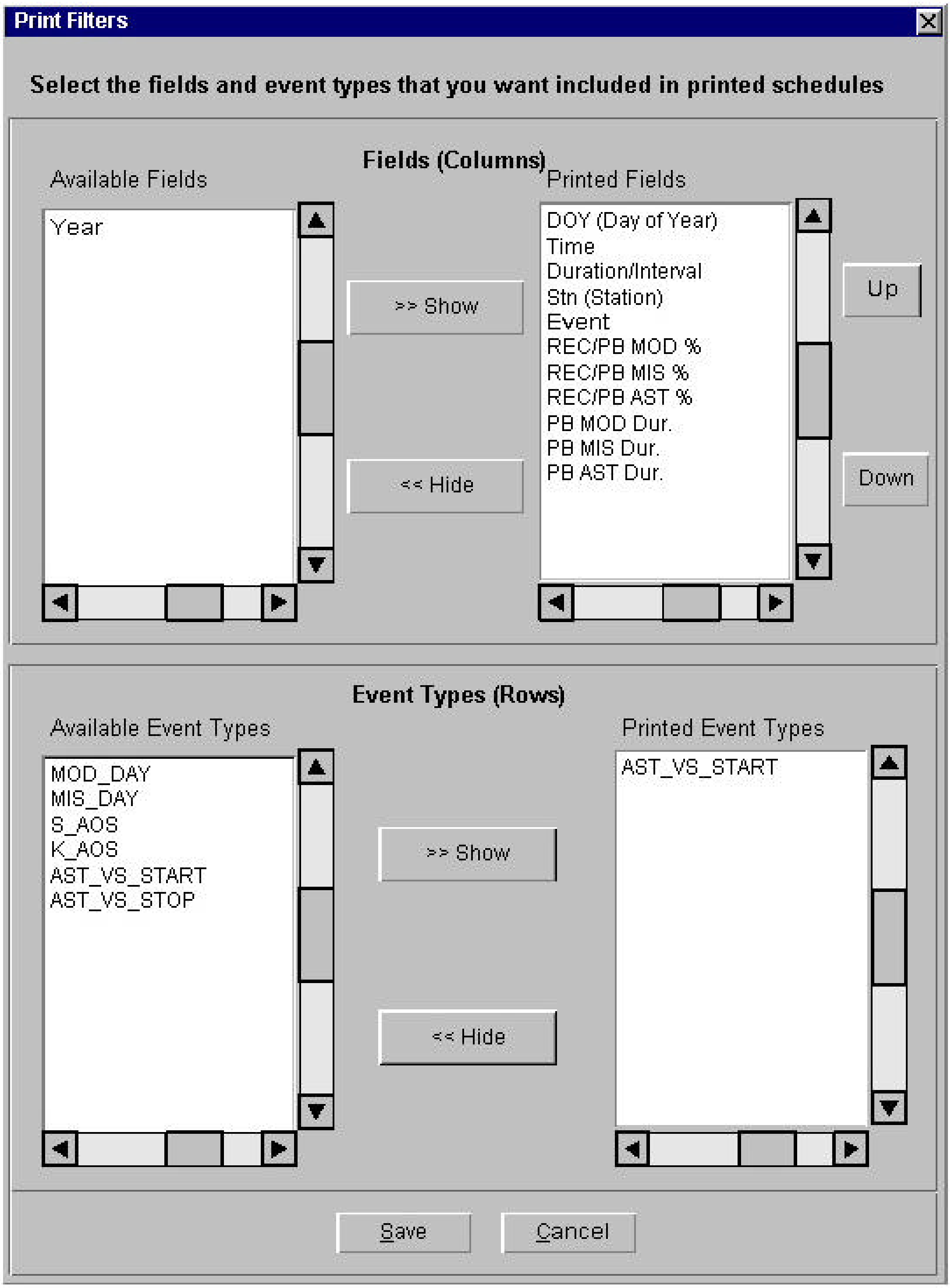


Figure 5-5: Edit Print Options



Description:

1. The SSR Scheduler selects the edit print filters option from the Main Window.
2. The Main Window creates an instance of the Filter UI and displays it to the SSR Scheduler.

3. The Filter UI retrieves the current print filter settings.
4. The Filter UI then retrieves a list of the filterable event types in the input reports.
5. The Filter UI displays the filters for SSR Scheduler modification.
6. The SSR Scheduler then selects which fields and event types are to be visible in hardcopy printouts of schedules and which are to be hidden.
7. The SSR Scheduler accepts the modifications by selecting the save option and the print filters are stored.
8. After saving the print filters, the Filter UI saves the modified event filters after the dialog is dismissed.

5.1.4 Edit/Add/Remove Dump Windows

Brief Description: When The SSR Scheduler selects the edit option for an existing dump window entry or the add option for adding a new dump window to a contact AOS, the system displays a dialog box through which the user modifies an existing dump window, removes an existing dump window, or adds a new dump window.

Note that there are three realizations for this use case. The first (Figure 5-7) describes the editing procedure for an existing dump window. The second (Figure 5-8) describes the creation of a new dump window within a contact. The third (Figure 5-9) describes the removal of an existing dump window.

5.1.4.1 Use Case Realization Edit Dump Window

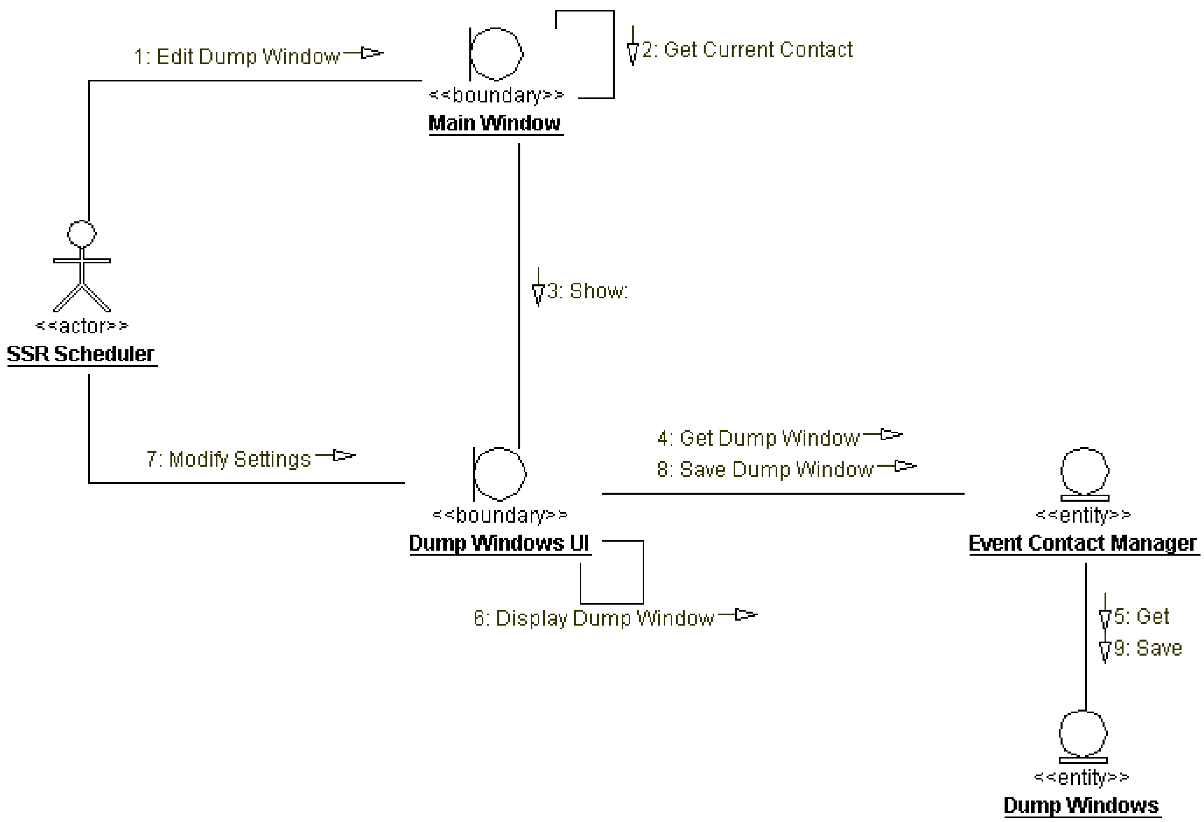
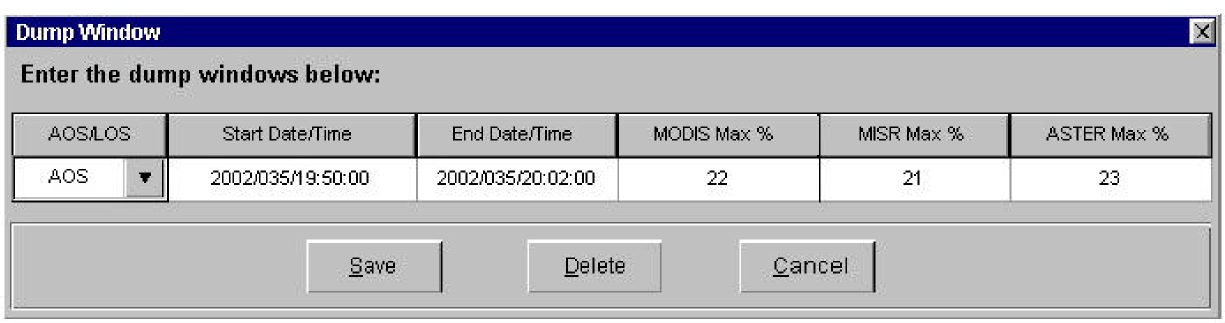


Figure 5-7: Edit Dump Windows



Description:

1. The SSR Scheduler selects the edit button for a particular dump window entry from the timeline in the Main Window.
2. The Main Window retrieves the contact information associated with the dump window.

3. The Main Window then creates an instance of the Dump Windows UI and displays it to the SSR Scheduler.
4. The Dump Window UI retrieves the contact information for the dump window.
5. The Dump Window UI retrieves the settings for the selected dump window.
6. The Dump Window UI then displays the values for SSR Scheduler review/modification.
7. The SSR Scheduler reviews and/or modifies the dump window settings, changing as needed the dump window placement, start time, stop time, and buffer max playback percentages for ASTER, MODIS, and MISR.
8. The SSR Scheduler accepts the modifications by selecting the save option.
9. The Dump Window UI saves the modified dump window settings for the contact window after the dialog is dismissed.

5.1.4.2 Use Case Realization Add Dump Window

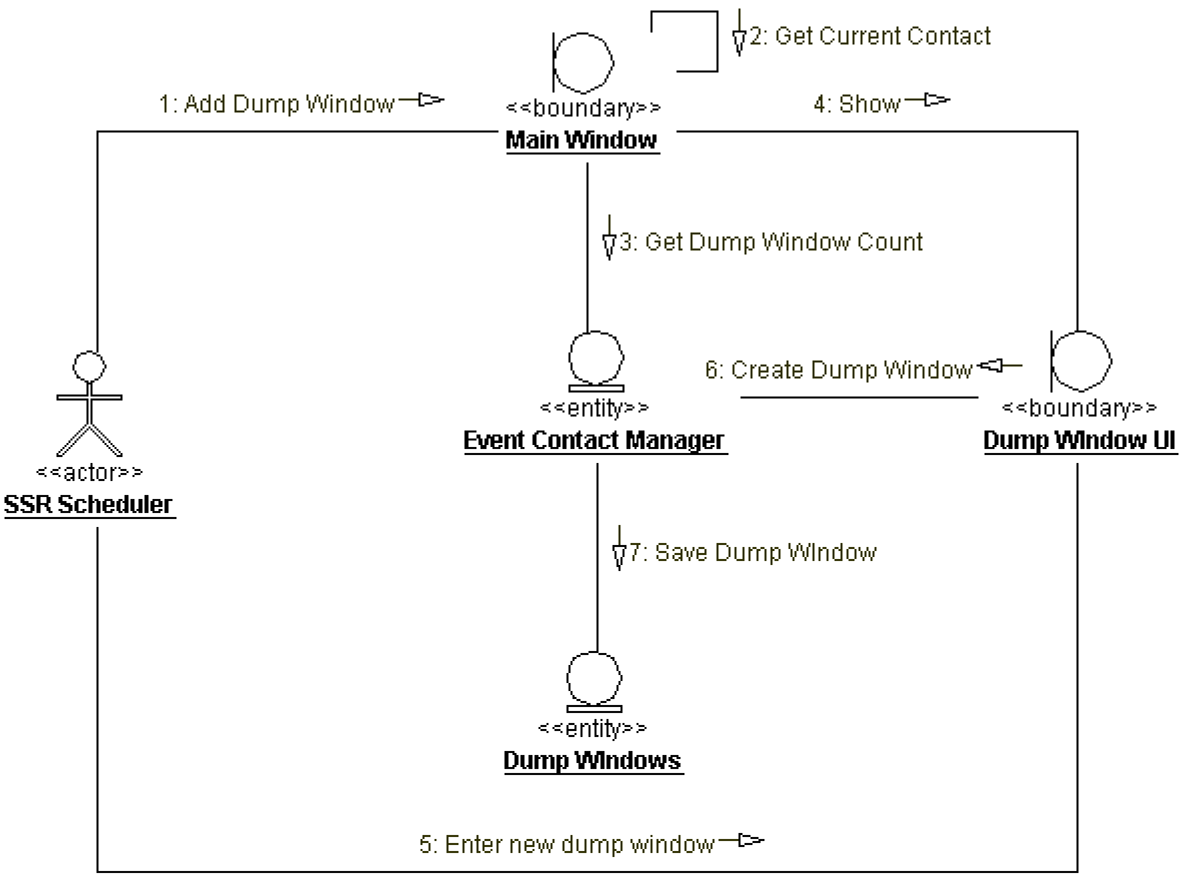


Figure 5-8: Add a Dump Window

Description:

1. The SSR Scheduler selects the add button for a particular K-AOS or X-AOS contact entry from the timeline in the Main Window.

2. The Main Window retrieves the current contact information.
3. The Main Window then checks to see how many dump windows exist for the selected contact.
4. The Main Window then creates an instance of the Dump Window UI and displays it to the SSR Scheduler if fewer than two dump windows exist for the selected contact.
5. The SSR Scheduler enters the values for the new dump window, specifying the position of the dump window within the contact (AOS or LOS), the start time and end time of the dump window, and the maximum playback percentages for each of the SSR Buffers.
6. The SSR Scheduler accepts the new dump window values by selecting the save option and the Dump Window UI updates the Event Contact Manager to reflect the added dump window.
7. The Event Contact Manager then saves the new dump window.

5.1.4.3 Use Case Realization Remove Dump Window

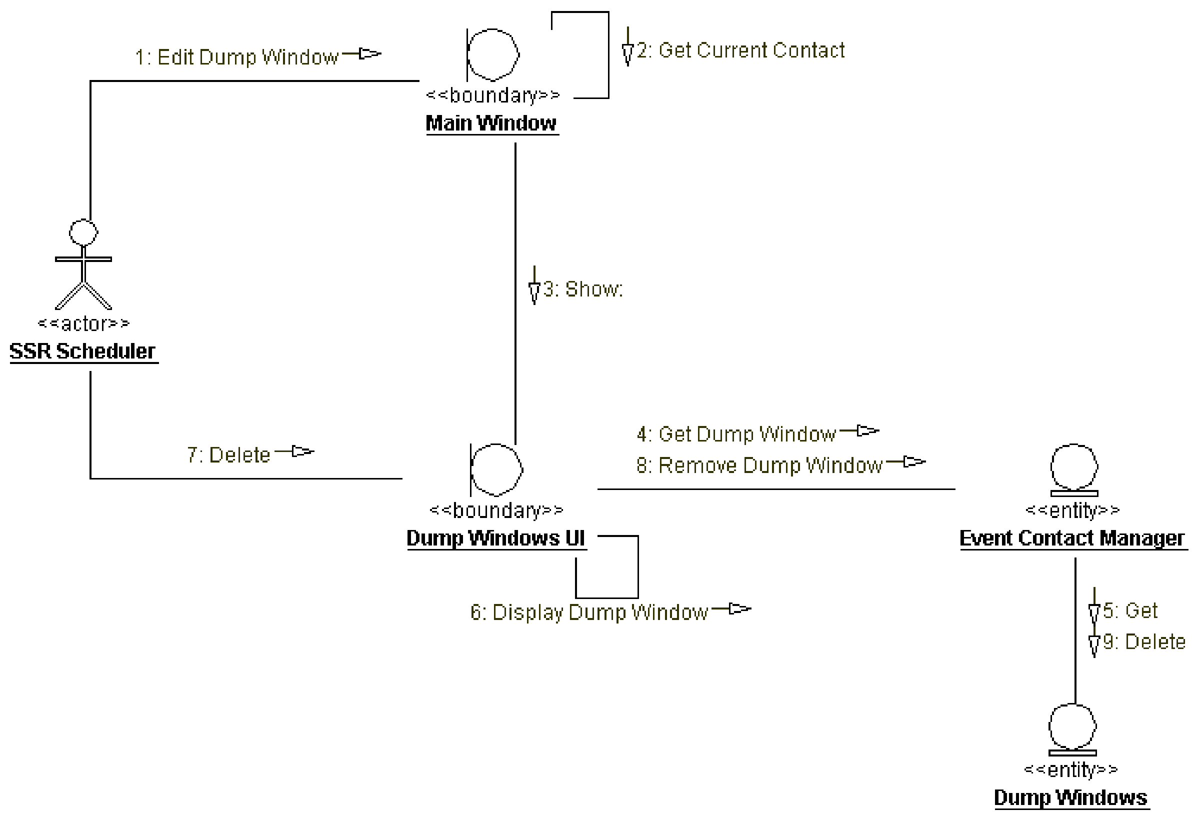


Figure 5-9: Remove Dump Window

Description:

1. The SSR Scheduler selects the edit button for a particular dump window entry from the timeline in the Main Window.
2. The Main Window retrieves the contact information associated with the dump window.

3. The Main Window then creates an instance of the Dump Windows UI and displays it to the SSR Scheduler.
4. The Dump Window UI retrieves the contact information for the dump window.
5. The Dump Window UI retrieves the settings for the selected dump window.
6. The Dump Window UI then displays the values for SSR Scheduler review.
7. The SSR Scheduler removes the dump window by selecting the delete button.
8. The Dump Window UI instructs the Event Contact Manager to remove the dump window entry from the contact.
9. The Event Contact Manager removes the dump window entry after the dialog is dismissed.

5.1.5 Edit Modeling Parameters

Brief Description: When the operator selects the edit modeling parameters option, the system displays a dialog in which the modeling parameters are displayed for user review and modification.

5.1.5.1 Use Case Realization Edit Modeling Parameters

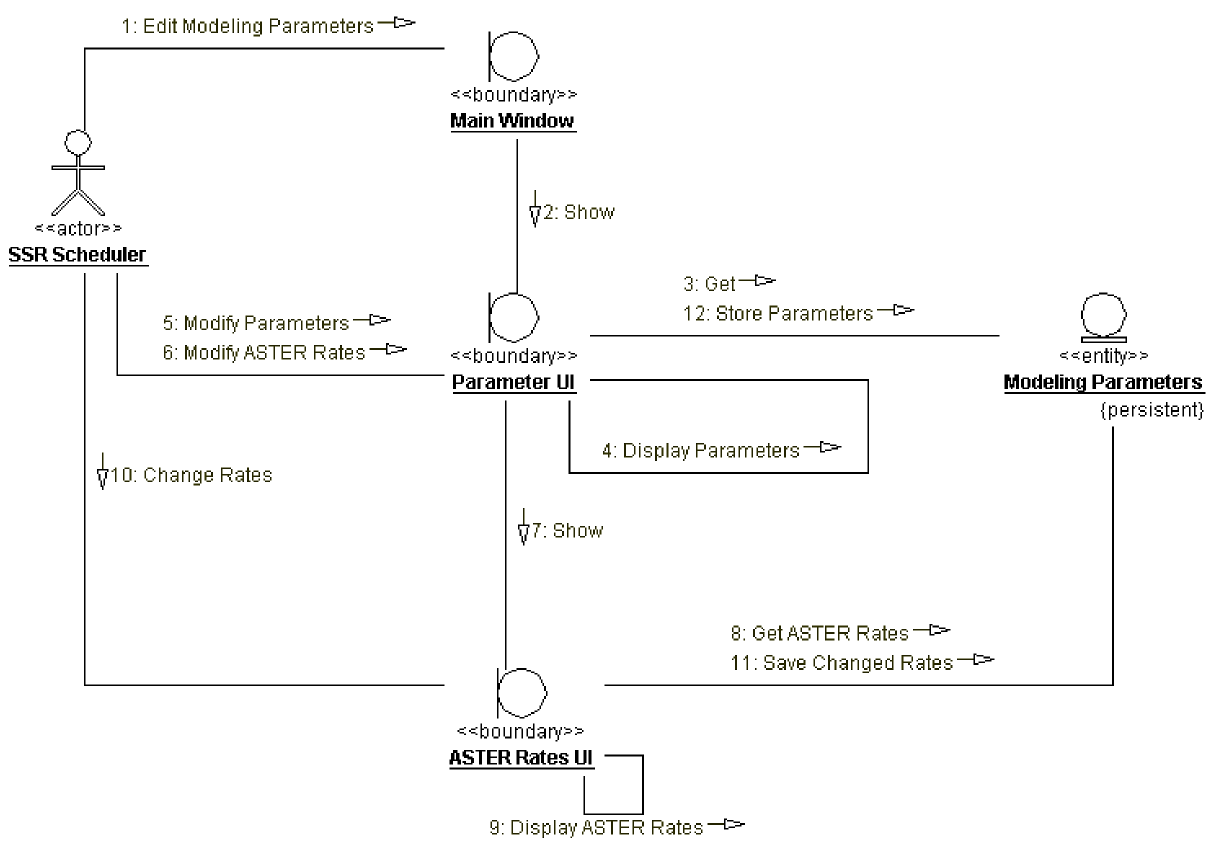
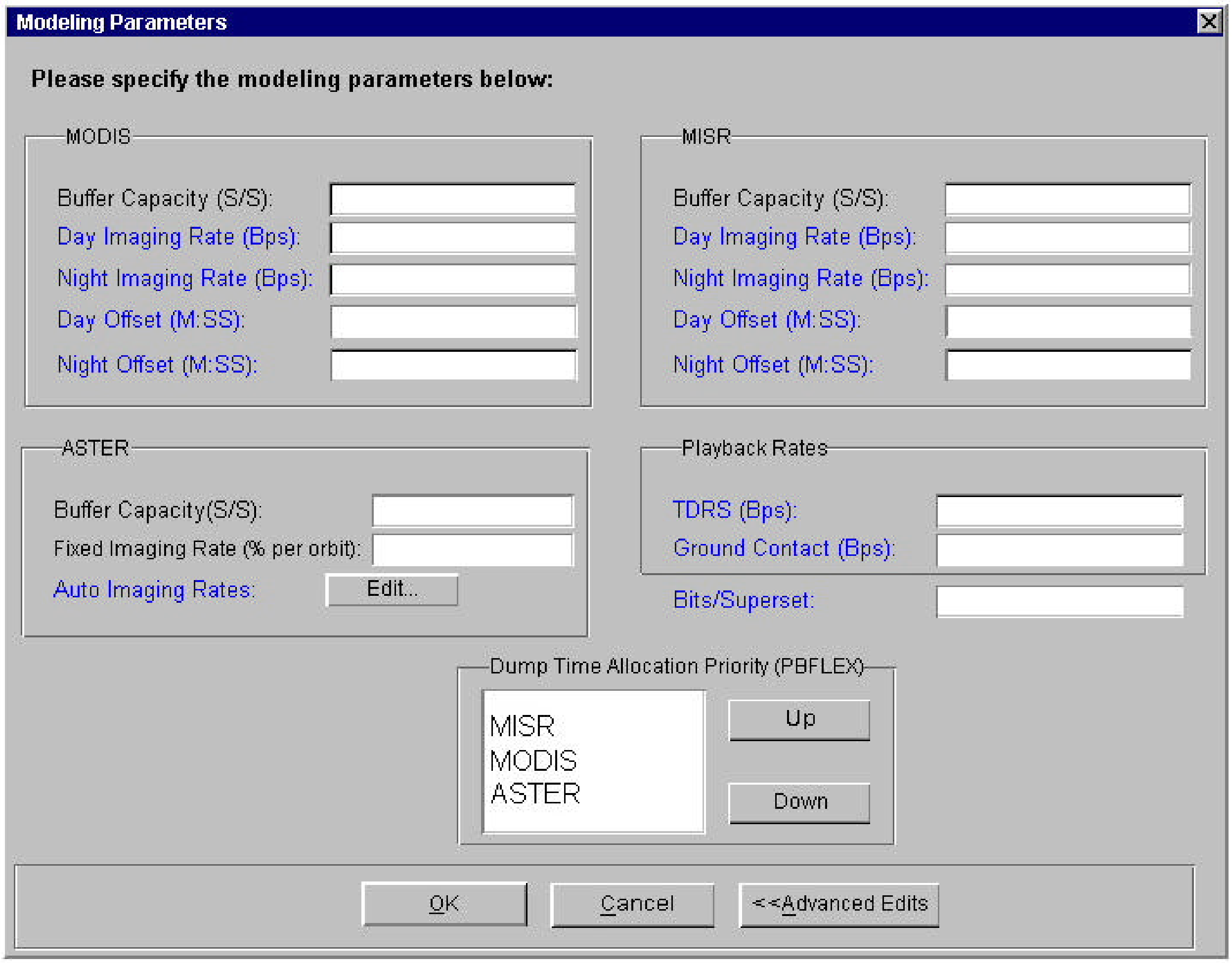
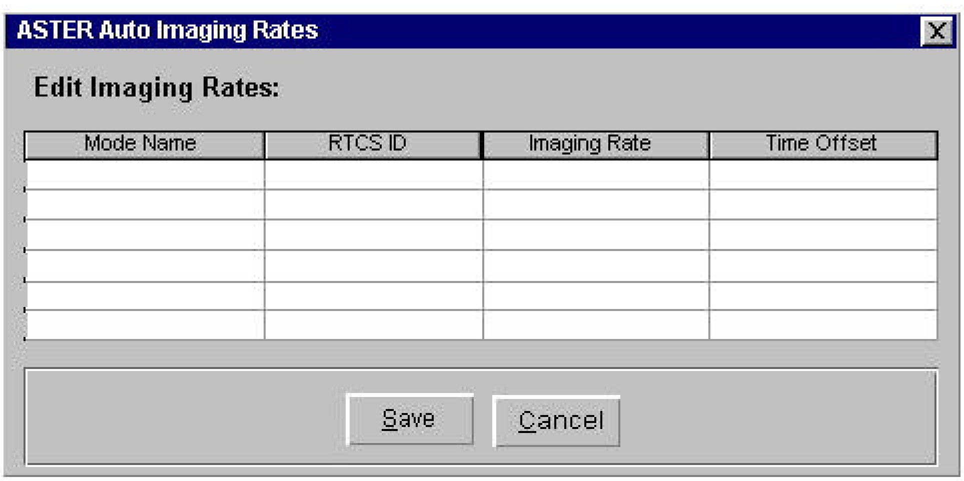


Figure 5-10: Edit Modeling Parameters





Description:

1. The SSR Scheduler selects the edit modeling parameters option from the Main Window.

2. The Main Window creates an instance of the Parameter UI and displays it to the SSR Scheduler.
3. The Parameter UI then retrieves the current modeling parameter settings.
4. The Parameter UI displays the values for SSR Scheduler review and/or modification.
5. The SSR Scheduler changes the values of the modeling parameters as needed.
6. If the SSR Scheduler needs to change the ASTER imaging rates for the different ASTER modes of operation, the edit aster imaging rates option is selected.
7. The Parameter UI creates an instance of the ASTER Rate UI and displays it to the SSR Scheduler.
8. The ASTER Rates UI retrieves the ASTER Imaging Rates from the persistent modeling parameters.
9. The ASTER Rates UI displays the rates and the associated parameters for user review/modification.
10. The SSR Scheduler modifies the ASTER Rates as necessary.
11. The SSR Scheduler accepts the modified rates and the ASTER Rates UI saves the modified ASTER modeling rates after the dialog is dismissed.
12. The SSR Scheduler accepts the Parameter modifications by selecting the save option and the Parameter UI saves the modeling parameter values after the dialog is dismissed.

5.1.6 Edit Sync Point Parameters

Brief Description: When the operator selects the edit synchronization parameters option from the Main Window, the system displays a dialog box in which the operator selects a sync point from a list of candidates.

5.1.6.1 Use Case Realization Edit Sync Point Parameters

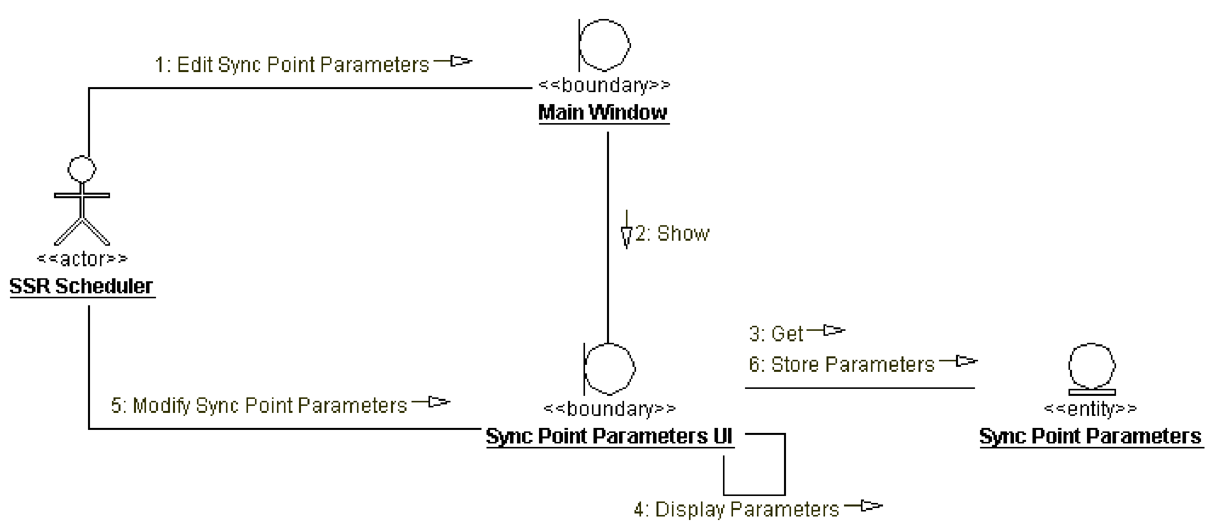
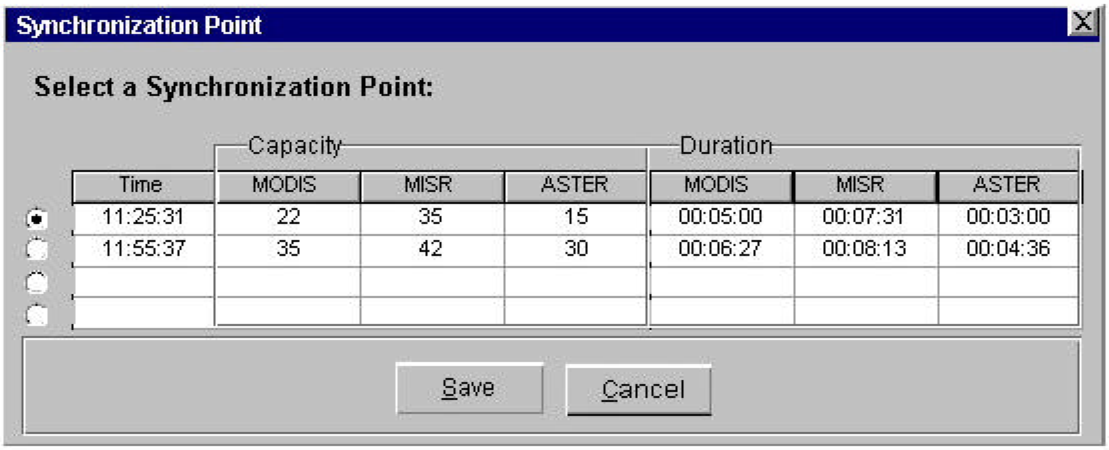


Figure 5-11: Edit Sync Point Parameters



Description:

1. The SSR Scheduler selects the edit sync point parameters option from the Main Window.
2. The Main Window creates an instance of the Sync Point Parameter UI and displays it to the SSR Scheduler.
3. The Sync Point Parameters UI retrieves the chosen sync point entry and the other candidate sync point entries for the delta window.
4. The Sync Point Parameters UI then displays the values for SSR Scheduler review and/or modification. Note that the system selected sync point entry will have the radio button next to it selected.
5. The SSR Scheduler then selects a different sync point entry by clicking on one the radio button next to the desired sync point.
6. The SSR Scheduler accepts the modifications by selecting the save option. The Sync Point Parameters UI saves the modified modeling parameter values after the dialog is dismissed.

5.1.7 Generate SSR Buffer Dump Schedule

Brief Description: When the operator selects the generate schedule option, the system generates buffer playbacks for each of the dump windows based on the extracted contacts, synchronization point, modeling parameters, and dump windows.

5.1.7.1 Use Case Realization Generate SSR Buffer Dump Schedule

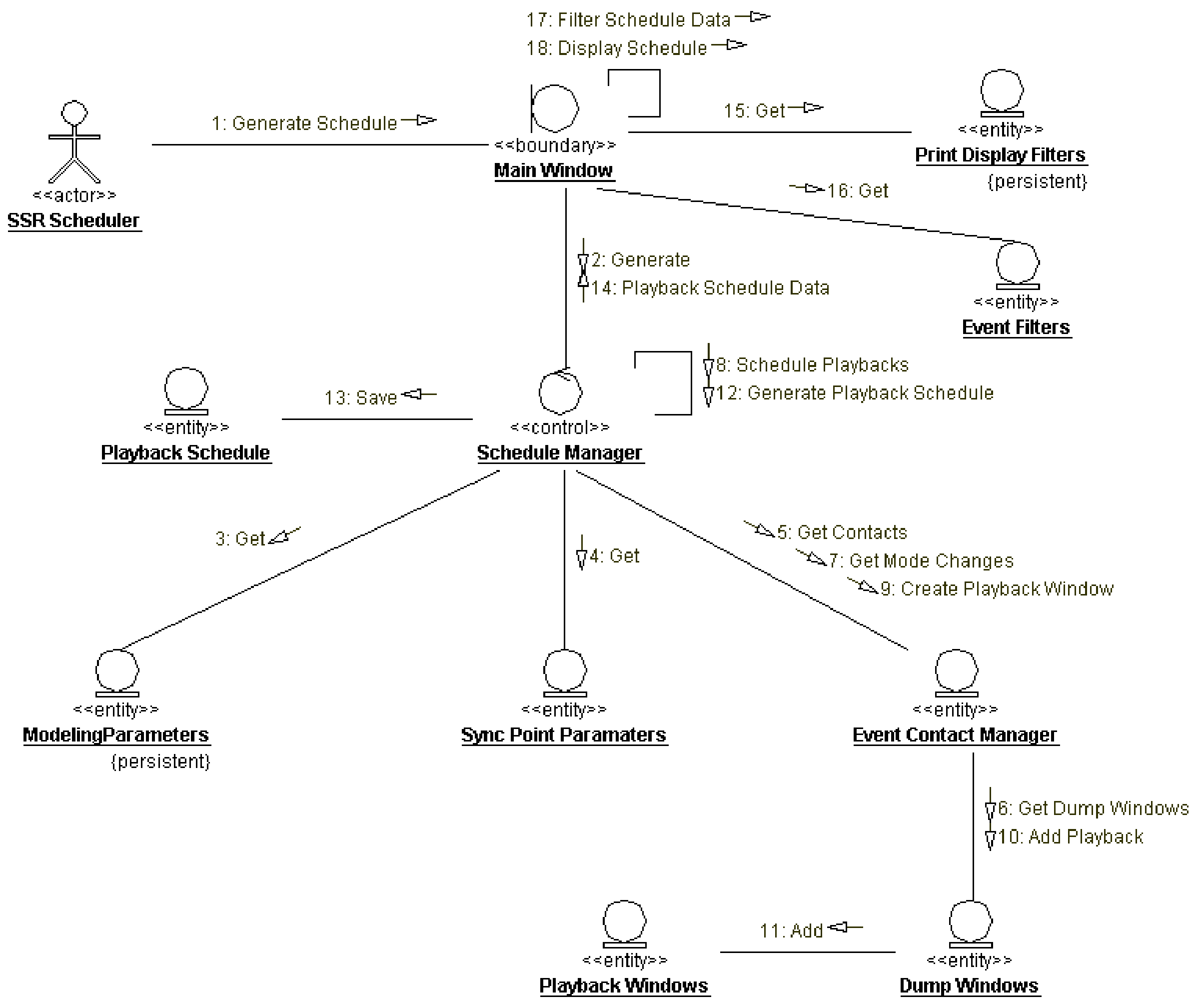
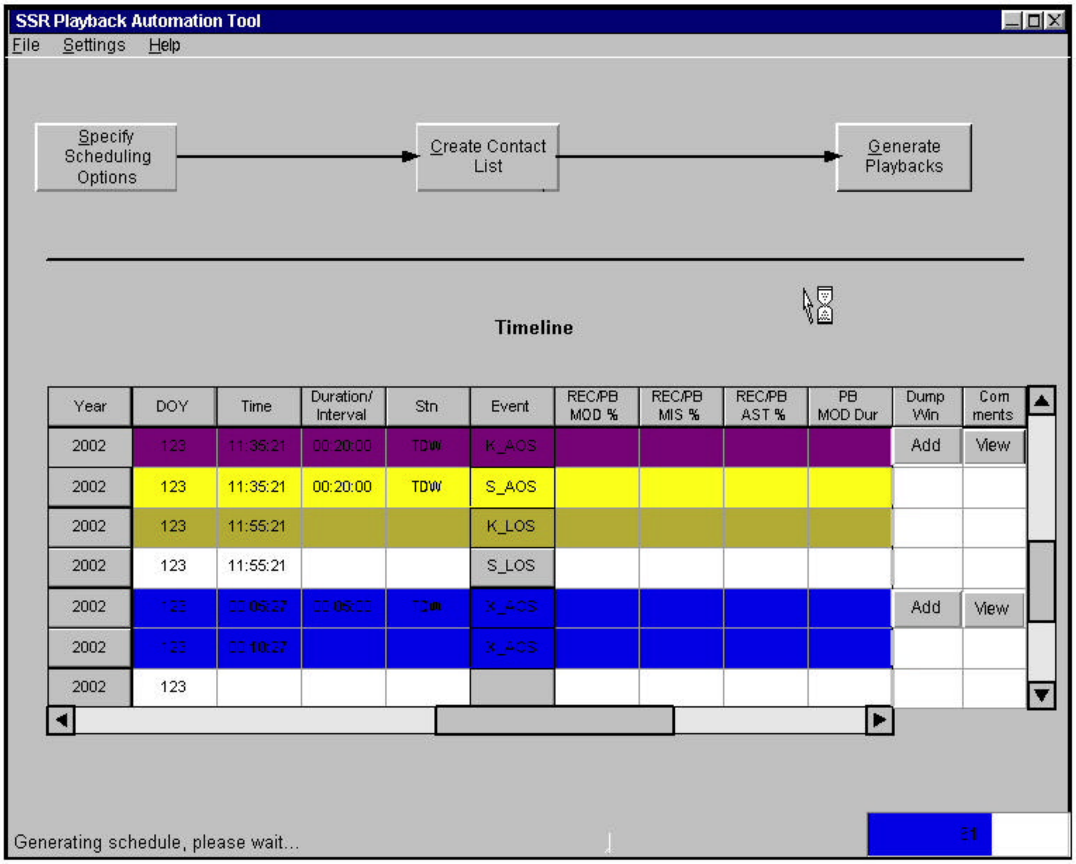


Figure 5-12: Generate Playback Schedule



Description:

1. The SSR Scheduler selects the generate schedule option from the Main Window.
2. The Main Window forwards the schedule generation request to the Schedule Manager.
3. The Schedule Manager retrieves the modeling parameters.
4. The Schedule Manager then retrieves the synchronization point parameters needed for schedule generation.
5. Based on the synchronization point, the Schedule Manager grabs the contact periods for the planning horizon.
6. The Schedule Manager then retrieves the selected dump windows for each contact period.
7. The Schedule Manager then retrieves a time ordered list of MODIS and MISR mode changes from the Event Contact Manager.
8. From the retrieved values, the Schedule Manager determines the fullness of the different SSR Buffers at each contact period based on imaging rates retrieved and instrument mode changes since the last buffer dump.
9. The Schedule Manager iteratively creates playback entries for each of the specified dump windows starting at the synchronization point. Playback windows are calculated from the known buffer percentages, the selected dump window durations, and the contact type.
10. As each playback entry is created, the Schedule Manager stores information about the playback with the associated contact window.

11. The Schedule Manager also associates the generated playback information with its corresponding dump window.
12. Once all dump windows have been processed, the Schedule Manager creates the final playback schedule.
13. The Schedule Manager then saves a copy of the complete schedule.
14. The Schedule Manager then returns the schedule data to the Main Window for display.
15. After receiving the schedule data, the Main Window retrieves the display filter options for data display.
16. The Main Window also retrieves the list of event type filters for data display.
17. After retrieving the filters, the Main Window filters the data so that only the desired fields and events are visible on the timeline.
18. After filtering, the Main Window displays the information on the timeline for operator review.

5.1.8 Print Dump Schedule

Brief Description: When the operator selects the print current schedule option, the system raises a dialog through which the operator selects print options for the current schedule.

5.1.8.1 Use Case Realization Print Dump Schedule

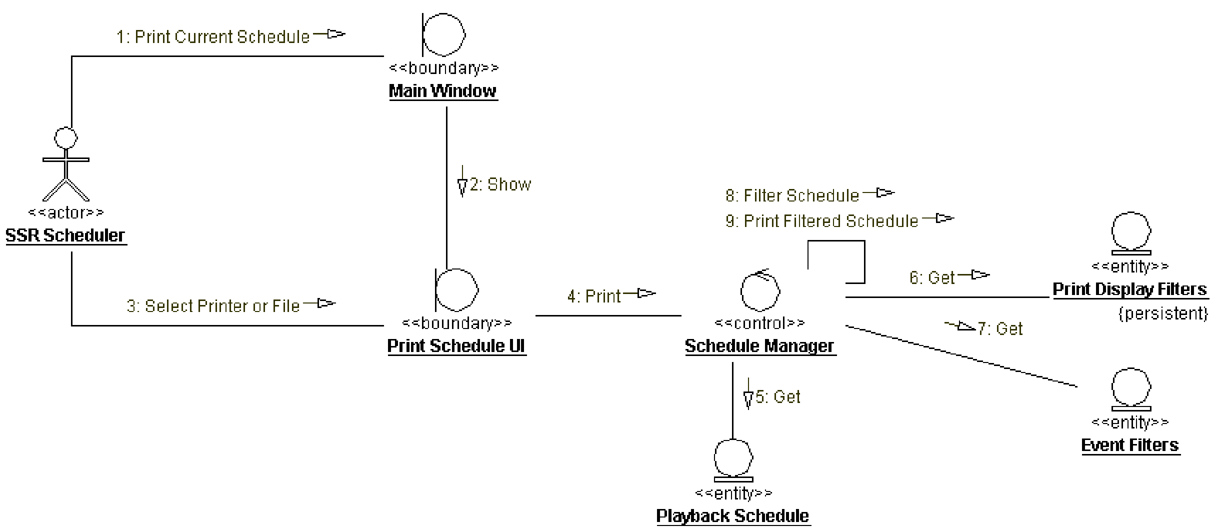


Figure 5-13: Print Schedule

Description:

1. The SSR Scheduler selects the print schedule option from the Main Window.
2. The Main Window creates an instance of the Print Schedule UI and displays it to the SSR Scheduler.
3. The SSR Scheduler selects either a printer or a file for the currently displayed schedule.

4. The Print Schedule UI sends a print request to the Schedule Manager with the request information including the name of the file or printer to which the schedule is to be sent.
5. The Schedule Manager then retrieves the saved version of the schedule.
6. The Schedule Manager retrieves the print filters.
7. The Schedule Manager then retrieves the event filters.
8. The Schedule Manager then applies the retrieved filters to the schedule data filtering out all undesired fields.
9. Finally the Schedule Manager sends the file to the appropriate printer or stores it to a disk file.

5.1.9 Process Input Reports

Brief Description: When the operator selects the create contact list option from the main window, the system responds by parsing the input reports and displaying the contact information and dump windows for operator review.

5.1.9.1 Use Case Realization Process Input Reports

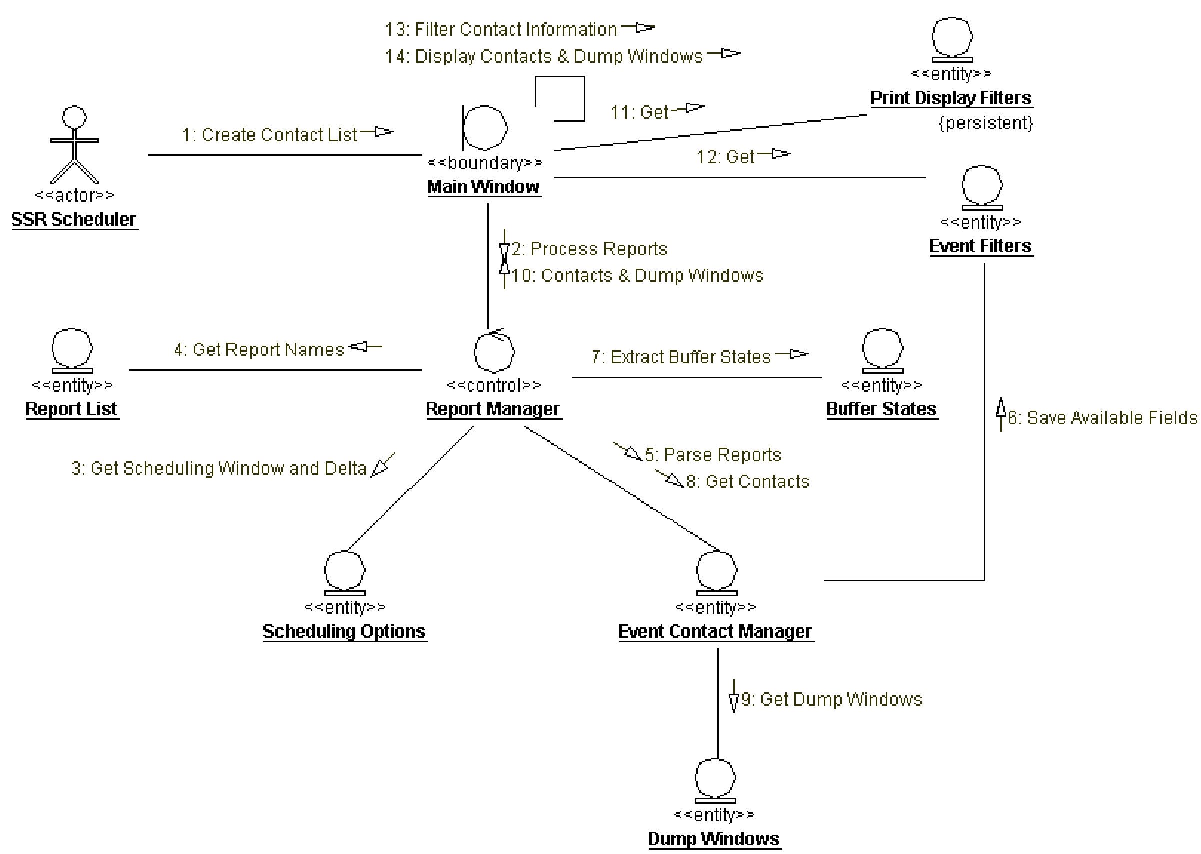


Figure 5-14: Process Reports

Description:

1. The SSR Scheduler selects the create contact list option from the Main Window.
2. The Main Window sends a request to the Report Manager to process the input reports.
3. The Report Manager then retrieves the scheduling window start, stop and delta (amount of time prior to the scheduling window start in which to look for a sync point. Specified as hh:mm) from the Scheduling Options and determines the time window for report parsing
4. The Report Manager then retrieves the names of the required input report.
5. After retrieving the names of the input reports the Report Manager sends a parse report request along with the planning horizon information to the Event Contact Manager.
6. The Event Contact parses the input reports, extracting and storing contact information and mode changes as well as the list of event types for display and print filtering.
7. Once Report Processing has completed, the Report Manager extracts the buffer state information from the SSR Buffer State report.
8. The Report Manager then retrieves the contact periods.
9. The Report Manager also retrieves the dump windows for each contact period.
10. The Report Manager then sends this information to the Main Window for display on the timeline.
11. After retrieving the contacts and dump windows from the Report Manager, the Main Window then retrieves the display filters.
12. The Main Window then retrieves the event type filters.
13. After the display and event filters have been retrieved, the Main Window filters the contact information and dump windows to remove unwanted fields and events.
14. After filtering, the Main Window displays the filtered information for operator review.

5.1.10 Retrieve Reports

Brief Description: When the operator selects the create contact list option, the Report Manager retrieves the required input reports for playback scheduling.

Note that in later versions of the SPLAT tool, there will be two ways to retrieve input reports, manual and automated. For the initial version of the SPLAT tool, only the manual process of retrieving input reports will be available. The interface to the MMS System is TBD and will be deferred until FY03. Figure 5-16 is the Use-Case realization for manual report retrieval.

5.1.10.1 Use Case Realization Retrieve Reports - Manual

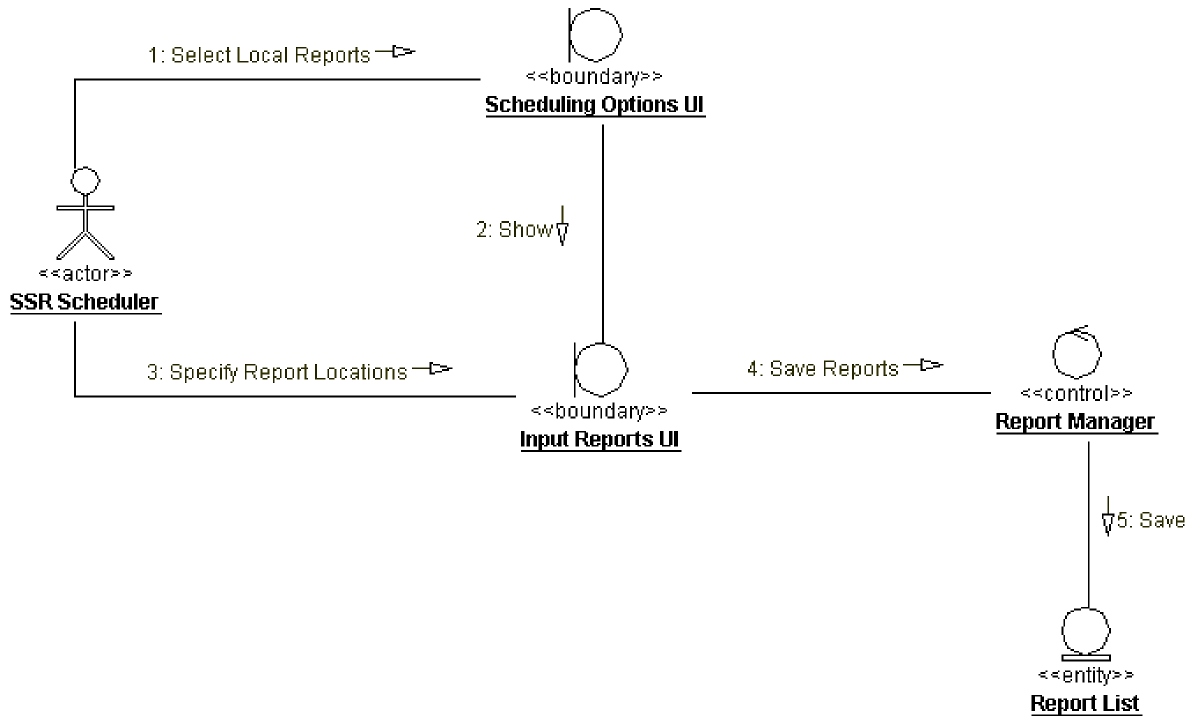
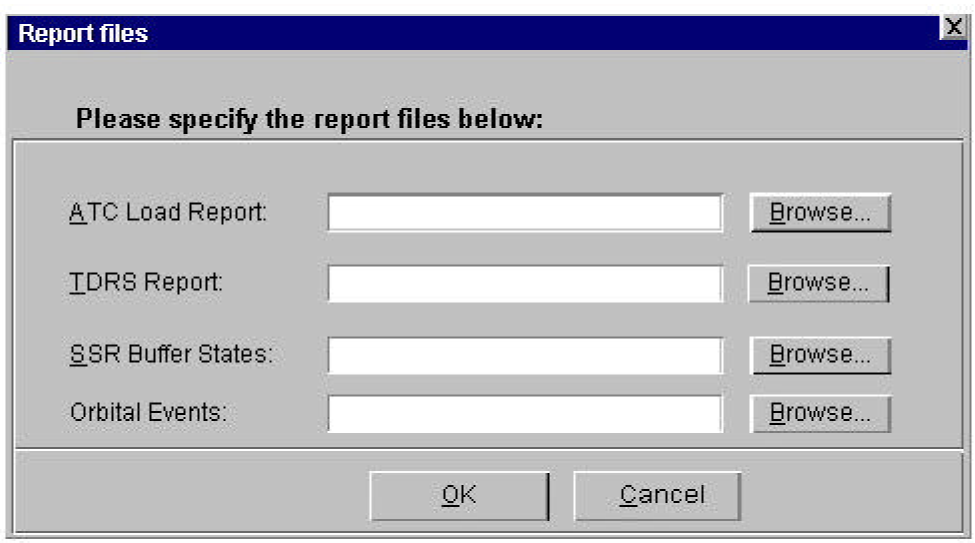


Figure 5-16: Retrieve Reports - Manual



Description:

1. The SSR Scheduler chooses manual report retrieval by selecting the local option for report location in the Scheduling Options UI.

2. The Scheduling Options UI creates an instance of the Input Reports UI and displays it for the SSR Scheduler.
3. The SSR Scheduler selects the browse option for each of the required input reports, specifying the location and name of the input reports.
4. The SSR Scheduler accepts the entered data by selecting the OK button. The Input Reports UI sends a save request along with the name and location of each report to the Report Manager.
5. The Report Manager stores the names and locations of the input reports for later use during report processing.

5.1.11 Save Dump Schedule

Brief Description: When the operator selects the save schedule option from the Main Window, the system displays a dialog for selecting the file name and location for the saved schedule.

5.1.11.1 Use Case Realization Save Dump Schedule

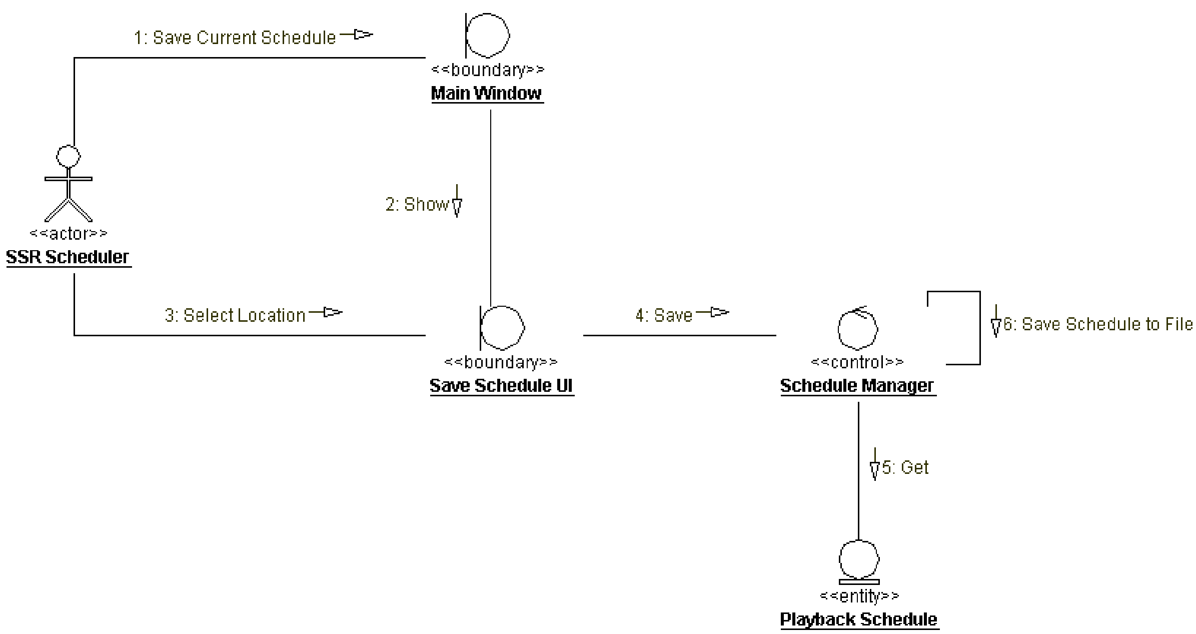


Figure 5-17: Save Schedule

Description:

1. The SSR Scheduler selects the save schedule option from the Main Window.
2. The Main Window creates an instance of the Save Schedule UI and displays it to the SSR Scheduler.
3. The SSR Scheduler enters a name and chooses a location (directory) for the saved schedule.

4. The SSR Scheduler accepts the file name and location by selecting the save option, causing the Save Schedule UI to send a save request to the Schedule Manager along with the location and name of the saved schedule.
5. The Schedule Manager retrieves the current playback schedule.
6. The Schedule Manager then saves the current schedule to the specified file and location.

5.1.12 Specify Scheduling Options

Brief Description: When the operator selects the specify scheduling parameters option, the system displays a dialog box in which the operator can enter and/or modify scheduling option values such as the scheduling horizon start and stop and the ASTER modeling mode.

5.1.12.1 Use Case Realization Specify Scheduling Options

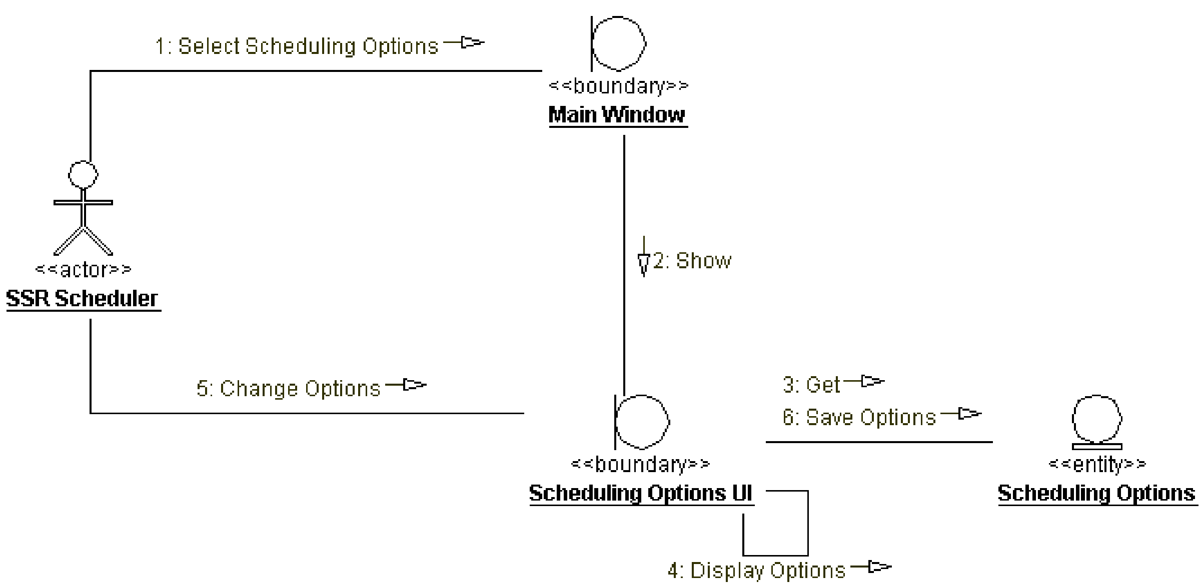
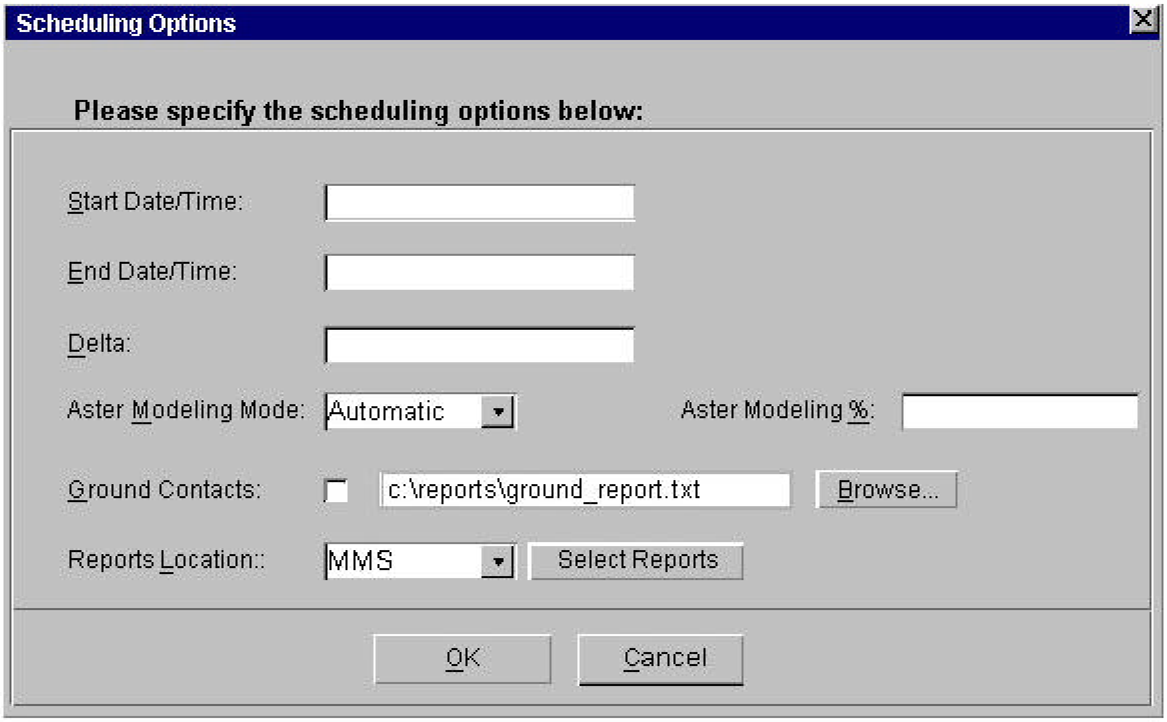


Figure 5-18: Specify Scheduling Options



Description:

1. The SSR Scheduler chooses the specify scheduling parameters options from the Main Window.
2. The Main Window creates an instance of the Scheduling Options UI and displays it to the SSR Scheduler.
3. The Scheduling Options UI retrieves the current scheduling option settings.
4. The Scheduling Options UI displays the scheduling options for SSR Scheduler review/modification.
5. The SSR Scheduler modifies or enters values for the scheduling window start and stop time, the delta (amount of time prior to the start of the scheduling window in which to search for the synchronization point. Specified as hh:mm) for the scheduling window, the ASTER modeling mode, and report location (MMS or Local). Note that while both options will be available only Local will be supported in the initial version of the SPLAT system.
6. After the SSR Scheduler has completed changes, the save option in the Scheduling Options UI is selected and the scheduling parameters are saved.

6 Logical View

In the Logical View the collaborations detailed in the Use Case View are combined into single class diagram that depicts the significant architectural elements. These are then organized into packages and service layers to create an Architectural Overview. The results of an analysis of concurrency and inter-process communication requirements are presented in the Process View.

6.1 Architecturally Significant Model Elements

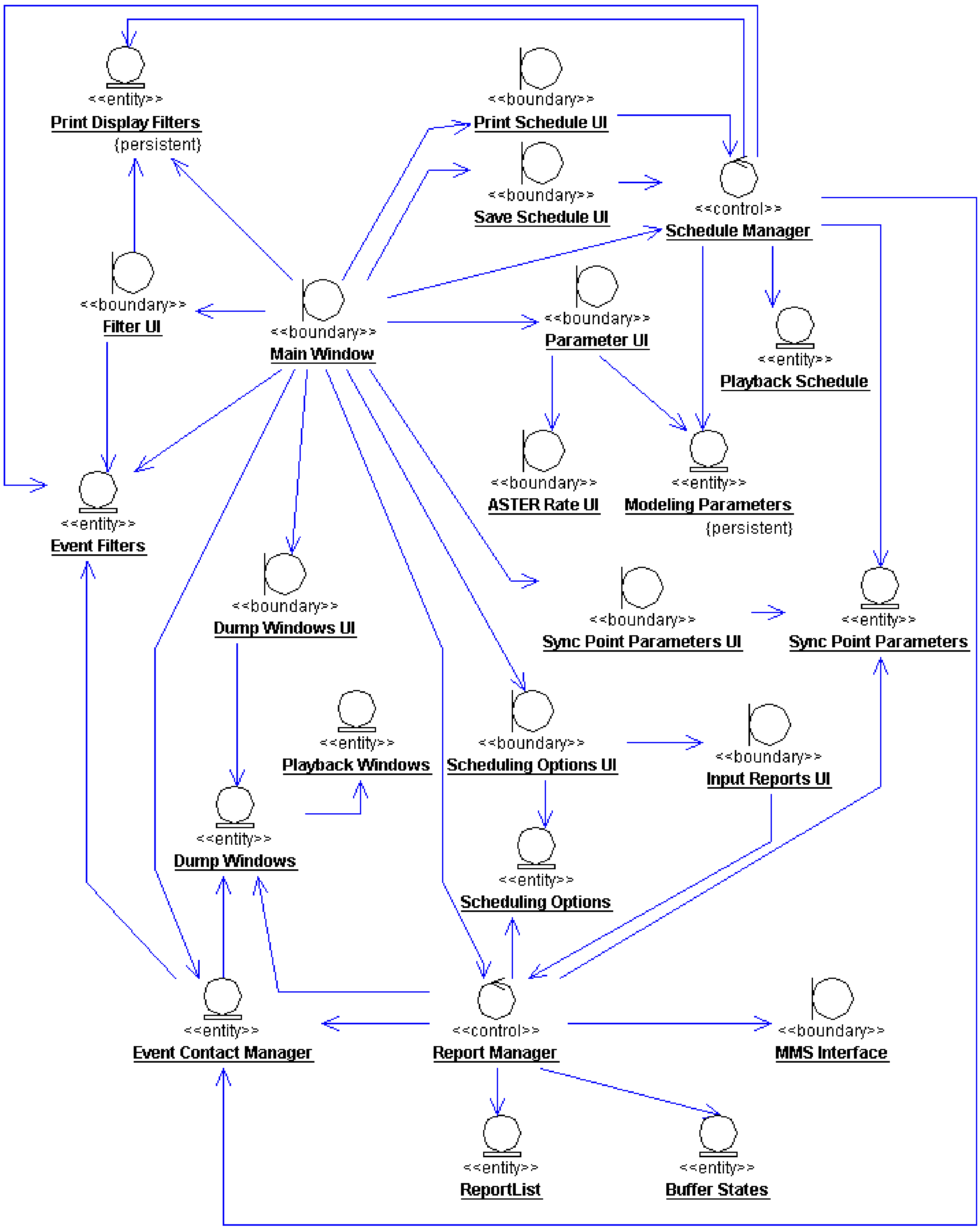


Figure 6-1: Architecturally Significant Model Elements

Diagram Documentation: Elements of the Design Model, which are considered architecturally significant, are presented in this diagram. The UML notation for boundary classes, entity classes and control classes is retained in this diagram. The following sections describe each of the elements depicted in the diagram.

6.1.1 ASTER Rates UI

boundary
This class represents a GUI through which the SSR Scheduler modifies the ASTER imaging rates for the different modes of ASTER operation. Included for each entry are an RTCS ID, name, and an imaging rate.

6.1.2 Dump Windows

entity
This class represents a single dump window. Dump windows indicate areas of opportunity for SSR buffer playback. Each dump window entry contains a start and stop time, and maximum playback percentages for each of the modeled buffers (ASTER, MISR, and MODIS).

6.1.3 Dump Windows UI

boundary
The class represents a graphical user interface through which the SSR Scheduler edits the parameters of a dump window entry. The editable fields of a dump window entry include the start and stop time as well as the maximum dump percentages for the ASTER, MISR and MODIS buffers.

6.1.4 Event Filters

entity
This class is a list of the available event types extracted from the input reports. The values from this class are presented to the SSR Scheduler in the Event Filter UI and are used when determining the event types displayed (visible) on the timeline in the Main Window.

6.1.5 Event Contact Manager

entity
This class encapsulates the knowledge needed to parse the input reports, and construct and manage a time ordered list of the contact windows and MODIS and MISR day/night events.

6.1.6 Filter UI

boundary
This class represents a graphical user interface to the Print and Display options and Event Filters class. Through this UI, the SSR Scheduler selects which of the available event types and fields are visible in the timeline display on the Main Window and/or stored in the printed schedule.

6.1.7 Input Reports UI

boundary
This class is a graphical user interface through which the SSR Scheduler specifies the locations (directories) on the local machine for each of the required input reports. This class is used to specify report locations when local reports (those on the same machine as the tool) are being used for schedule generation.

6.1.8 Main Window

boundary
This class is a graphical user interface and represents the main window for the SPLAT tool. Through this UI the SSR Scheduler specifies scheduling options, edits the dump windows, and generates playback schedules. This window contains a tabular, scrollable display window in which the generated schedule and extracted events are displayed for the SSR Scheduler.

6.1.9 MMS Interface (TBD)

boundary
This class represents the SPLAT interface to the MMS system. This interface is TBD. It is only here as a placeholder. Actual implementation of this interface is deferred until FY03.

6.1.10 Modeling Parameters

entity
This class represents the modeling parameters used during playback schedule generation. The values stored in this class include playback rates for the different contact types, imaging rates for the different instruments, instrument modes, buffer capacities, and conversion constants.

6.1.11 Parameter UI

boundary
This class is a graphical user interface that provides an interface to the modeling parameters.

6.1.12 Playback Windows

entity
This class represents the playback windows associated with a particular dump window. Each playback window contains a start and stop time, a name, playback times for each of the buffers, buffer full percentages, etc.

6.1.13 Playback Schedule

entity
This class represents the final playback schedule. It contains a time ordered list of contact windows, dump windows, generated buffer playbacks, comments, and mode change events.

6.1.14 Print Display Filters

entity
This class contains a list of all schedule fields (both visible and hidden). The values in this class are used to filter the schedule for custom display and hardcopy generation.

6.1.15 Print Schedule UI

boundary
This class is a graphical user interface for printing a hardcopy of the current schedule. It is a standard print dialog that allows the SSR Scheduler to select a printer or file in which to print the schedule to a printer or a file.

6.1.16 Report List

entity
This class is a list of the input report names and locations of the reports required to generate a playback schedule.

6.1.17 Report Manager

control
This class controls the report ingestion, dump window and sync point determination, report storage, and report parsing aspects of the SPLAT system.

6.1.18 Save Schedule UI

boundary
This class is a graphical user interface. Through this UI, the SSR Scheduler selects the file name and location for saved schedules.

6.1.19 Schedule Manager

control
This class controls the generation of playback windows, the creation of playback schedules, the printing of playback schedules and the storage of playback schedules to disk.

6.1.20 Scheduling Options

entity
This class maintains the SSR Scheduler specified scheduling options. Contained in this class are the schedule start and stop times, the schedule delta (amount of time prior to the start of the scheduling window in which to search for synchronization points), the ASTER modeling mode and/or percentage, the location of input reports, and the location and use of ground station reports.

6.1.21 Scheduling Options UI

boundary
This class is graphical user interface to the Scheduling Options class. Through this UI, the SSR Scheduler enters and/or modifies the scheduling options.

6.1.22 Buffer States

entity
This class is a time ordered list of all Buffer State entries extracted from the Buffer State Report. Each buffer state entry contains a time stamp, buffer full percentages for the ASTER, MISR, and MODIS buffers, and durations for each of the buffers.

6.1.23 Sync Point Parameters

entity
This class is a time ordered list of all buffer state entries in the delta window (window prior to the start of the scheduling window in which to search for the synchronization point) before the start of the scheduling horizon. Each entry in the list contains a time stamp, ASTER, MISR and MODIS buffer usages for each of the entries in the list, and durations for each of the buffers. The contents of this class are presented to the SSR Scheduler in the Sync Point Parameters UI.

6.1.24 Sync Point Parameters UI

boundary
This class is a graphical user interface providing an interface to the Synch Point Parameters class. The UI displays a time ordered list of the SSR Buffer state entries during the four or six hour window (delta) prior to the start of the scheduling window.

6.2 Architecture Overview – Package and Subsystem Layering

The SPLAT system is organized into three layers. The User Services Layer provides user interfaces for workflow management and interaction with schedules. The Scheduling Services Layer encapsulates the processing required to ingest and translate manually retrieved MMS scheduling reports, and create SSR buffer playback schedules, and the Data Management Layer. The packaging of classes within these layers is described in the following sections.

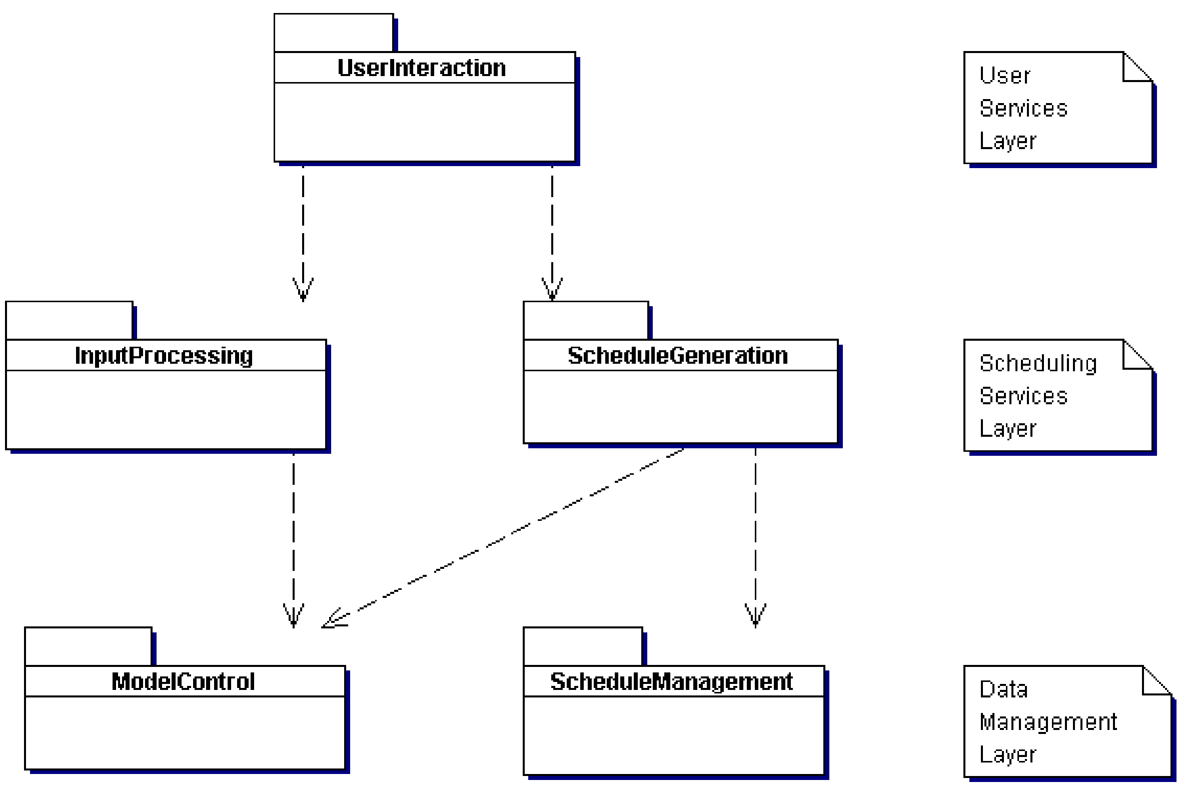


Figure 6–2: Packages and Layering for SPLAT

6.2.1 User Interaction

The User Interaction package contains the GUI components and supporting classes that allow the user to enter special event scheduling windows, select print and display filters, view the playback scheduler, and control schedule generation. These include:

?? Main Window
?? Print Schedule UI
?? Save Schedule UI
?? Parameter UI
?? Filter UI
?? Dump Windows UI
?? Sync Point Parameters UI
?? Scheduling Options UI
?? Input Reports UI

6.2.2 Input Processing

The Input Processing package contains the classes and interfaces required to ingest and manage the input report files from MMS (TBD) or a local directory, and extract the contacts and MODIS/MISR mode change events from them. It includes the:

?? Report Manager
?? Event Contact Manager
?? Report List
?? Buffer States
?? MMS Interface (TBD)
?? Playback Windows

6.2.3 Schedule Generation

The Schedule Generation package contains the classes that control and execute creation of SSR buffer playback schedules. The included classes are:

?? Schedule Manager
?? Dump Windows
?? Sync Point Parameters

6.2.4 Model Control

The Model Control package contains classes that provide information describing modeling parameters and modes of operation for the Terra instruments as well as scheduling options affecting operation of the tool. These include:

?? Scheduling Options
?? Modeling Parameters

6.2.5 Schedule Management

The Schedule Management package contains classes that provide control over schedule storage and display. These include:

?? Event Filters
?? Print Display Filters
?? Playback Schedule

7 Process View

This section presents an architectural view that describes the concurrent aspect of the system: tasks (processes and threads), persistent objects and their interactions.

7.1 Processes and Threads

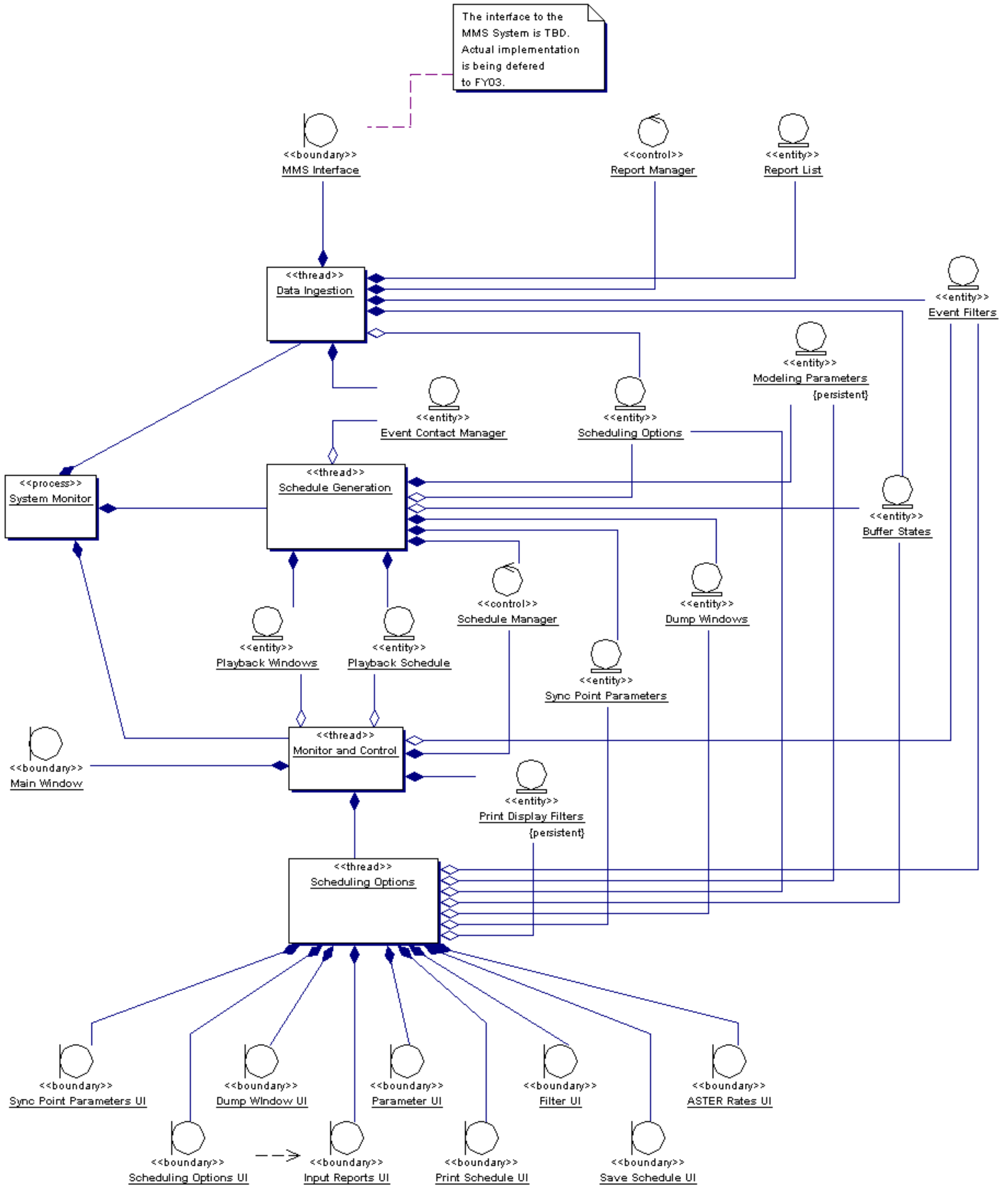


Figure 7-1: SPLAT Process View Diagram

7.1.1 System Monitor

The System Monitor process is the central control process of the SPLAT tool. It is started from the command line and it initiates the Report Retrieval process, the Data Ingestion thread, the Schedule Generation thread, and the Monitor and Control thread

7.1.2 Data Ingestion

The Data Ingestion thread is responsible for reading input reports, parsing out the pertinent events and contact periods, and determining the set of filterable event types for schedule generation.

7.1.3 Monitor and Control

The Monitor and Control thread creates and manages the Main Window GUI through which the operator controls the schedule generation, and views/modifies schedules and scheduling options.

7.1.4 Schedule Generation

The Schedule Generation thread encapsulates all the functions and classes necessary to generate the SSR Buffer playback schedules. The functions included in this thread are: dump window determination, sync point calculation and actual playback generation.

7.1.5 Scheduling Options

The Scheduling Options thread encapsulates all GUI operations relating to schedule option entry/manipulation. The operations performed in this thread include the display and management of GUIs for modeling parameter entry/modification, dump window and sync point editing, and schedule saving and printing.

8 Deployment View

Description: The Deployment Views shown in Figure 8-1 define the typical physical network configurations, including those typically used by end users, as well as special configurations used for development and test.

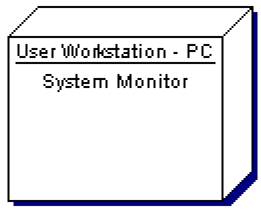


Figure 8-1: SPLAT Deployment Diagram (Local Report Retrieval)

8.1 User Workstation

This node hosts the SPLAT system. It connects to the EOC Workstation via LAN connection and communication between the two nodes in the system is via Remote Method Invocation (RMI) for report extraction query request and status, and via secure FTP for report file transfer.

9 Size and Performance

This section provides a description of the major dimensioning characteristics of the software that affect the architecture, as well as the target performance constraints.

1. **Average schedule generation times** (see System Requirements Document) – These requirements were derived from discussions with the Flight Operations Team (FOT) staff charged with generating special event schedules. Scheduling these events manually can take anywhere from 30 minutes to several days depending on the complexity of the event. Since SPLAT will automate the manual task of generating these schedules, a significant time savings is expected and schedule generation times would be in-line with those mentioned in the requirements specification.
2. **Average report extraction times** (see System Requirements Document) – These requirements were derived from discussions with the FOT staff. Since the SPLAT feature supporting automated extraction of reports adds only a minimal overhead over the manual procedure, the report extraction time limits specified in the requirements specification are in-line with current manual report extraction times.

10 Quality

The software architecture described will support the reliability and supportability requirements for the system by virtue of the loose coupling between the MMS system (TBD) and the SPLAT tool and the modular design of the system. Usability requirements are addressed by using simple, yet functional, graphical user interfaces for operator interaction with the system.

11 Glossary

Table 11-1 contains a list of the acronyms and abbreviations used in this document along with a brief description of each acronym.

Acronym/Abbreviation	Term	Definition
AOS	Acquisition of Signal	A term describing the acquisition of signal for a TDRS satellite or ground station. Used in determining dump times for Terra.
ASTER	Advanced Spaceborne Thermal Emission and Reflection	Instrument on-board TERRA owned and operated by the Japanese space agency.
EOC	EOS Operating Center	This is the center from which the Terra and, in the future Aqua and Aura, satellite(s) are operated from
FOT	Flight Operations Team	The group of engineers charged with monitoring and maintaining a spacecraft on orbit.
FTP	File Transfer Protocol	A standard protocol for transferring files across networks of computers.
GOC	Goal Oriented Commanding	The predecessor to SPLAT. GOC was to provide a system that allowed an operator to command a satellite or constellation of satellites using natural language commands and goals.
GSFC	Goddard Space Flight Center	
GUI	Graphical User Interface	A graphical interface (dialogs, etc.) through which a user interfaces (communicates) to a computer system or program.
LAN	Local Area Network	
LOS	Loss of Signal	A term describing the loss of signal for a TDRS satellite or ground station. Used in determining dump times for Terra.

MISR	Multi-angle Imaging Spectro-Radiometer	An instrument on the Terra spacecraft
MODIS	Moderate Resolution Imaging Spectrometer	An instrument on the Terra spacecraft.
MMS	Mission Management Software	Unique to EOS, this system is the primary mission planning system for Terra. Among other products, it creates the TDRS Contact Report, and includes basic models for generating command loads.
NASA	National Aeronautics and Space Administration	
SPLAT	SSR Playback Automation Tool	The tool being developed to assist with SSR buffer playback scheduling for special events.
SSR	Solid State Recorder	This is Terra's on-board storage device. It operates using buffers wherein data from each instrument (4 buffers total) and housekeeping data are stored for later downlink to a ground station.
UI	User Interface	Synonymous with GUI.
UML	Unified Modeling Language	